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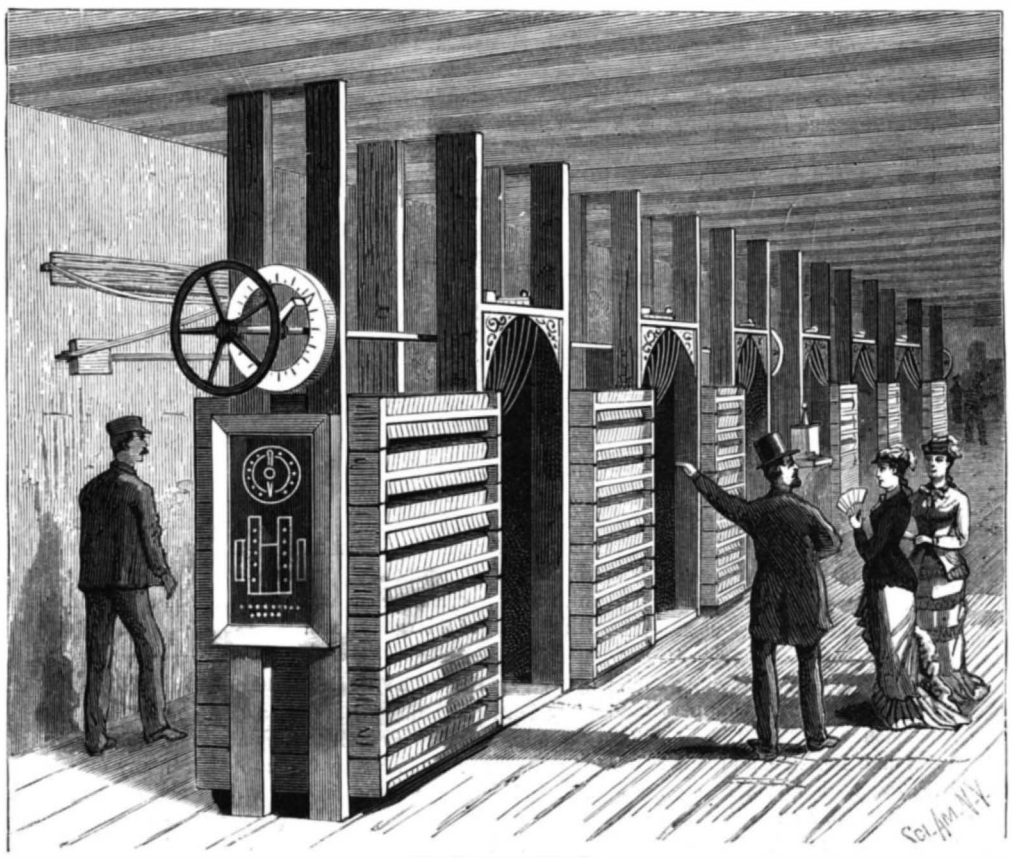
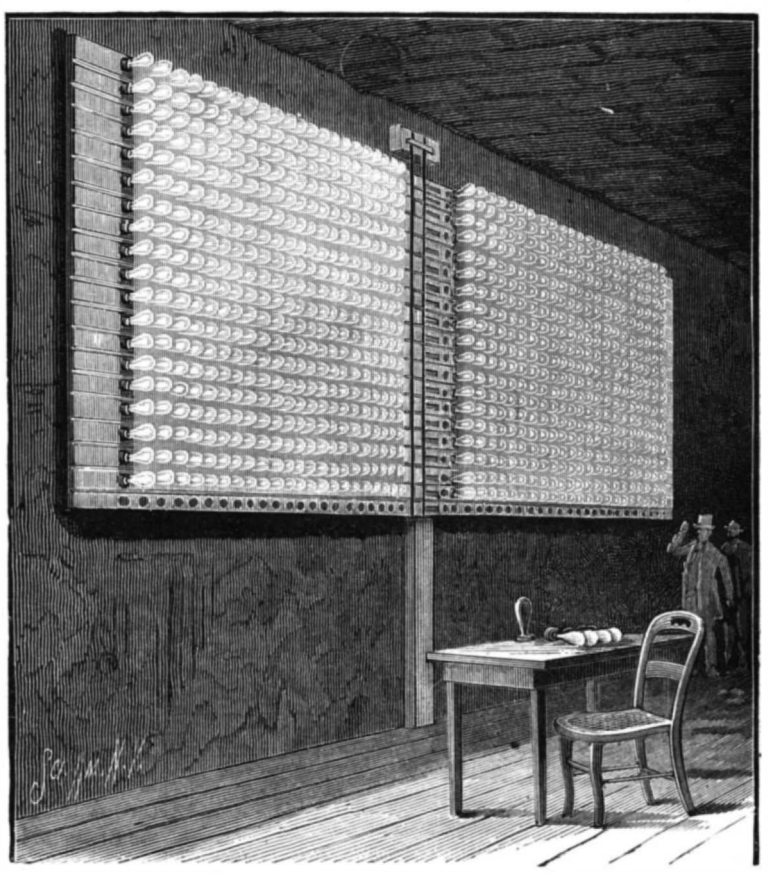
THE EDISON ELECTRIC LIGHTING STATION.

On Pearl street, near Fulton, under the shadow of the Third Avenue Elevated Railroad, and but a minute's walk from Fulton Ferry, is an iron front building, originally put up for commercial purposes, but which for a year or more has been in process of preparation for a central electric lighting station under the Edison system. The beginning of this great work was indicated by the laying of underground conductors around every block in that portion of the city bounded on the east by the East River, on the west by Nassau street, on the north by Spruce and Ferry streets and Peck Slip, and on the south by Wall street. This district includes 946 consumers, whose premises are already wired. The number of lamps to be used in connection with these wires is 14,311. From the basement of the building referred to radiate large semicylindrical copper conductors, insulated from each other and arranged in pairs, each pair

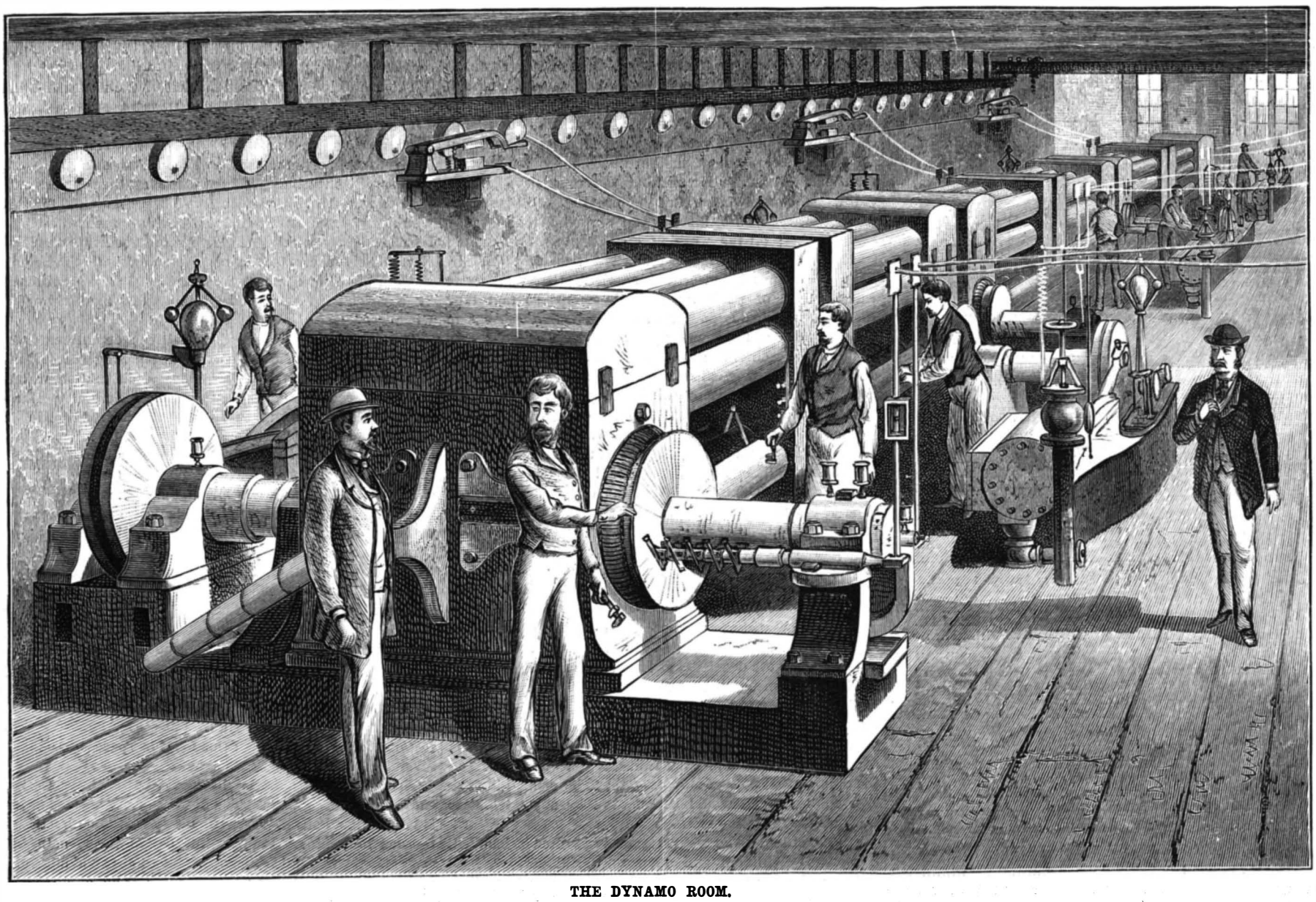
[*Continued on page* 130.]



THE REGULATOR.



TEST BATTERY OF 1,000 LAMPS.



THE DYNAMO ROOM.

FIRST EDISON ELECTRIC LIGHTING STATION IN NEW YORK.

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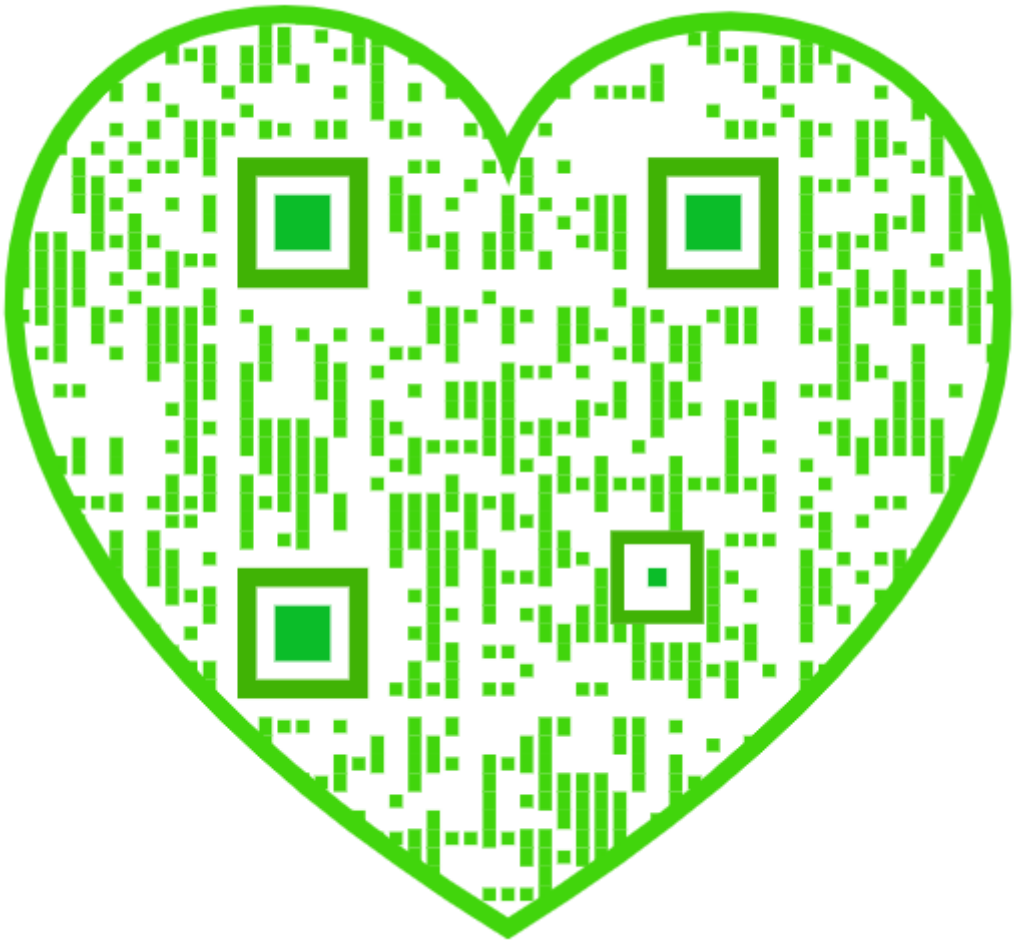

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NEW YORK, SATURDAY, AUGUST 26, 1882.

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POSTAGE STAMP LOSSES.

On several occasions the postal department has tried to determine approximately the number of pieces of each sort of mail matter transmitted by the post offices of the country in the course of a year. To keep an accurate record of each day's work throughout the year would add to the labor of the offices and involve delays that would cost more than the information would be worth. Accordingly the department has been content to make one week's work, as determined by actual count, the basis of an estimate for the year. A week thought likely to be one of average postal activity is selected, and all the matter received for transmission at each of the post offices is classified and counted, the aggregate of such original business during the appointed time being reckoned as the fifty-second part of the business of the year. Obviously the closeness of the approximation hinges entirely upon the fitness of the selected week to represent the average weekly work of the year.

Knowing approximately the number of pieces of each sort of mail matter handled, it is possible to estimate roughly the revenue the Government ought to receive from the sale of stamps, cards, stamped envelopes, etc., and from other postal charges. The estimate would necessarily involve a good deal of assumption and guesswork; yet if the estimated or calculated volume of business done is not unreasonably wide of the truth, the estimated revenue ought to be something near the actual revenue as reported in sales of stamps and the rest.

The *Evening Post* has gone to the trouble of collating the statistics given in the last annual report of the Post Office department, and comparing the sums which, according to its calculation, should have been paid for the conveyance of the matter embraced in the year's work as officially estimated, with the sums actually received, finding very serious discrepancies.

The sale of stamps, cards, stamped envelopes, etc., for the year aggregated $34,625,436. Assuming the department's estimate of annual business to be correct, and the *Post's* analysis of it equally correct, the department should have received from the sources named $42,795,815. The deficiency in receipts for the amount of matter conveyed thus exceeded eight million dollars. The *Post* remarks: "The immense deficiency in the number of postage stamps sold, according to the department's figures, is made especially striking by adding together the postage values of the letters and postal cards which made up the first-class mail. By so doing we obtain the sum of $34,628,784.84. If we deduct from this the $34,625,435.91 of postage stamps sold, without allowing for the special stamps and wrappers not used on letters, we have a deficiency of $3,348.93—leaving the whole of the second, third, and fourth class mails to be carried for nothing, and treating registration as free. If the $1,398,674 of newspaper and periodical stamps and the $431,154.60 of newspaper wrappers be deducted from the sum total of stamps sold, and the remainder be deducted from the value of the first-class mail, a deficiency of $1,833,177.53 appears in the revenue from that class of matter alone."

The experienced postmaster of this city, Mr. Pearson, to whom the *Post's* figures and deductions were submitted, mentioned four causes which might have contributed to produce the discrepancy: (1) Issued but unused stamps carried over from the previous year; (2) over-estimation of the number of pieces of mail matter handled; (3) unwise selection of the time for making the seven days' count, the week chosen being first before the holiday season, when the mails are more heavily loaded than at any other period; (4) the washing and fraudulent reissue of stamps. That the last cause was a very efficient one Mr. Pearson did not believe. He admitted that there were various ways of washing canceled stamps so that they could be used again, and it was possible that persons in different parts of the country practiced these methods independently of each other; he was confident, however, that no organized conspiracy existed for this purpose, since it would not be possible to dispose of large quantities of washed stamps without the plot being discovered.

The assumption that the concerted washing of stamps on a large scale would be necessary to cause the Government to lose materially by reused stamps will hardly hold. There are nearly 45,000 post offices in the country, and if the department were to carry from each office a single fraudulently stamped letter a day, the Government would be cheated to the extent of nearly half a millon dollars a year. It may not be possible to dispose of $8,000,000 worth of washed stamps in bulk; yet out of ten million letter writers it would not be possible to find enough who are willing to use again cleaned or imperfectly canceled stamps, and having opportunities enough to do it to cheat the revenue out of all that the deficiency is found to be.

That the cancellation of stamps is very frequently imperfect is known to all who handle many letters. In many instances the stamp is not defaced at all; in more the mark is so slight that it may be easily rubbed off. Mr. Pearson admits that no cancelling ink is ineffaceable, and expresses the opinion that postage stamps ought to be printed in fugitive colors, which would be removed by any attempt to wash off the canceling mark.

The conditions under which stamps must often be handled, however, by children and other unskillful persons, both before and after they are put upon matter to be mailed, forbids the use of other than fairly permanent ink in printing them. They are held in sweaty hands, carried in pockets, where they are subject to dampening by rain, perspiration, and the like, and always liable to over-wetting when the gum is moistened to affix them. Hence the necessity of good paper and waterproof ink.

If stamps are used, security against their reuse must be sought rather in some means of canceling them indelibly or destructively. Thus far no ink has been discovered that could not be discharged or washed off by suitable means. For destructive cancellation many devices have been tried to cut, abrade, rupture, or burn the paper of the stamp. None of these, however, have proved entirely satisfactory, their tendency being to mutilate or set on fire the letter or parcel the stamp is applied to. A more promising plan contemplates the use of a stamp of two parts, one to be gummed to the letter or package, the other to be left free, to be torn off by the postmaster and destroyed, making it impossible to use the same stamp again.

This plan seems well calculated to prevent the reuse of stamps except by parties inside the post offices, where there is reason to suspect a large part of this fraud upon the revenue is perpetrated. In multitudes of offices the new mail matter often lies for hours before being made ready for transmission. In such cases there is little or nothing to prevent a dishonest clerk from removing the uncanceled stamps and substituting those that have already been canceled. The individual frauds may be small, yet if frequently repeated in a large number of places, the aggregate loss to the department may mount up to millions.

The most obvious way of stopping frauds of this nature would seem to be the use of stamped envelopes and wrappers; and in view of the probable saving to the revenue by preventing reuse, the Government might find it profitable to encourage the more general employment of stamped envelopes, by allowing to purchasers of them a considerable discount from the price of the stamps. It might be practicable also to print the stamps across the face of the envelopes in such a way that in the writing of the address the stamp would necessarily be canceled. The usual post marks would suffice to show whether any wrapper had done its appointed service.

The ingenious reader will readily see how inviting a field is here presented for successful invention. The large amount of revenue involved, and the urgent demand the world over for a practical preventive of the frauds pointed out, make it certain that whoever will solve the problem will not fail of a large reward.

THE DENVER MINING EXPOSITION.

The National Mining Exposition just opened at Denver, Colorado, would be a credit to the oldest and richest of mining regions. Indeed it may be doubted if in any other part of the world so large and instructive an array of precious metals and their ores could have been collected for such a purpose. The effect in convincing the visiting world of the substantial wealth of a multitude of mining districts scattered over the Rocky Mountain country, and now known only as outlandish names on the newer maps, cannot but be enormously beneficial to the States and Territories represented.

The exhibition was opened the first of the month, and has been a popular success from the start.

The exhibition building is a handsome and substantial structure covering four acres. It is in the form of a cross, 500 feet from north to south, and 300 feet from east to west, with spacious vestibules and entrances at the four extremities. There are 2,000 linear feet of galleries, 29 feet in width, supported by solid columns, and approached by eight broad and easy stairways. Two more stairways and two elevators give access to the central tower, 80 feet in height. Each of the eight corner towers, 70 feet high, is approached by a special stairway. The building is lighted by 800 windows.

The exhibits are arranged in thirteen departments: (*a*) Mineralogy, with eleven classes, comprising ores of the precious and the useful metals, clays, coals, and other metalliferous specimens; (*b*) Geology, eight classes; (*c*) Hardware, edge tools, and all cast and wrought iron goods, in four classes; (*d*) Metallurgical machinery, in four classes; (*e*) Agricultural and horticultural products, and floral displays, dairy products, etc., six classes; (*f*) General machinery, including steam engines and machine tools, printing, pneumatic, leather working, and laundry machinery, five classes; (*g*) Agricultural and horticultural implements, machinery, tools, carriages, wagons, etc., four classes; (*h*) Textile fabrics, leather, furs, and the like, four classes; (*i*) Household goods, watches, jewelry, optical and scientific instruments, ornamental articles, ceramics, etc., six classes; (*k*) Liberal arts, natural science, and education, five classes; (*l*) Food preparations and miscellaneous articles used in domestic economy, miners' supplies, etc., three classes; (*m*) Chemical and medicinal preparations, illuminating and lubricating oils, etc., four classes; (*n*) Miscellaneous unclassified articles. The main building contains over 150,000 square feet of floor area, yet the demands for space have made several annexes necessary.

The machinery is driven by a 250 horse power Corliss engine of Chicago make. The display of mining machinery is very full and attractive, particularly to those directly interested in mining. Popular interest, however, naturally centers in the vast and varied collections of ores and minerals, which have been gathered by carloads from hundreds of mining districts scarcely yet heard of by the Eastern world.

Through her advantages of situation and superior mining

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development Colorado naturally leads in the richness and variety of her exhibits. This State has suddenly risen to the first rank as a silver producer, and stands close to the head of the list of Gold States. In the relation of production to area Colorado holds the first rank; for gold and silver combined she stands at the head, and likewise for silver alone. Exclusive of coal and iron her metallic product the census year was twenty-two and three quarter million dollars, and nearly if not quite as much last year. Lake county, which yields more than half the total product of the State, is richly represented in the exhibition, but not quite so brilliantly as the newer district of Gunnison county, which has required an annex to receive the excess sent by the enthusiastic miners. The Gunnison exhibits include thousands of pounds of rich carbonates, great blocks of ruby silver, native silver, iron, coal, and marble. For the transportation of one block of galena weighing 4,000 pounds a special road had to be constructed over the mountains. From the other mining districts of the State generous contributions of gold, silver, lead, and copper ores have been sent to the exhibition, the baldest enumeration of which would fill columns.

The exhibits from Utah rank next to those of Colorado in variety and volume. About fifty productive mines and over a hundred prospects are represented. The majority are silver-load ores; among the rest are ores of antimony—one block of 3,000 pounds assaying 60 per cent; bismuth; a 500 pound block of sulphur, nearly pure; great masses of iron ore; brown coals from beds of three to thirty feet in thickness; mineral wax from the Wahsatch Mountains; marbles in great variety, and other minerals testifying to the vast undeveloped wealth of the great basin.

The exhibits from New Mexico embrace a great variety of silver, gold, copper, and lead ores, turquoises, and small specimens of all the minerals found in the Territory; also a fine display of native jewelry, Pueblo pottery, blankets, etc. Grant county sends specimens from two hundred mines, and other counties are represented by ores from a hundred mines or more each. The Arizona exhibits come mainly from the Tombstone District and from Pima and Pinal counties.

The Copper Queen Mine sends a pyramidal mass of copper ore weighing two tons. It is a carbonate, assaying from twenty three to twenty-five per cent. A seven ton block of galena is to be added to the exhibits from this territory. Some of the richest ore is contributed by the West Side Mine, assaying 3,339 ounces silver to the ton, with a large assay of gold. Another specimen yields 2,905·7 ounces of silver and 21·88 ounces of gold. The Contention property exhibits a sample of telluride of gold and horn silver that assays $1,762.10 gold and $12,378.15 silver. A specimen from the Grand Central Mine, Tombstone District, weighing 115 pounds, runs $11,923.22 to the ton, of which $2,286.29 is gold and $9,536.93 silver.

Wyoming, Montana, Dakota, and Idaho are represented by specimens aggregating many tons, among them a block of soda from Wyoming, weighing 500 pounds, and Montana ores assaying as high as 3,300 ounces of silver.

Though presenting less of novelty, the agricultural displays are large and attractive; and the same may be said of the machinery departments, which comprise a great variety of crushers, amalgamating machines, pumps, engines, excavators, and other appliances for raising and reducing the buried wealth of the mountains. The exhibition will remain open until October, and part of it is intended to be permanent.

PRISON ELECTRICITY.

Opposition to prison labor is not altogether unreasonable from the standpoint of the artisan whose trade is invaded and the products of whose labor are undersold by contractors employing convicts. Yet to the public at large the maintenance of large numbers of prisoners in unproductive idleness would appear still more outrageous, indeed not to be thought of.

That offenders against the peace and property of the community should be made self supporting, however, is not more simple and reasonable in theory than it is difficult to put into practice. It is particularly difficult with those who most need the discipline of labor—the petty offenders who fill our police courts and penitentiaries under short time sentences. It is not easy to find useful employment for unskilled tramps, drunkards, station-house rounders and the like, who make up the large portion of the criminal classes and ultimately furnish most of the long term convicts. The latter can be taught the simpler trades, and, under the contract system or otherwise, made to pay for their keeping or more, though the conditions under which such labor is massed and employed are such as to yield results not at all pleasing to those who are employed in the same trades outside of prison walls.

Originally the clause "hard labor" in the sentences of malefactors contemplated labor purely as a punishment. It was not productive labor. The convict was put into a treadmill or set to turning a loaded crank, no attempt being made to utilize the energy exerted. The treadmill has been displaced partly for sentimental, partly for economic reasons. The convicts hated it, and no useful result came of it. The substituted factory system yields better results, and worse. Prison labor is now productive; but it is apt to interfere grievously with prison discipline, and also with the rights, real or fancied, of honest labor, as may be seen in the universal condemnation of prison labor by trades unions.

It is suggested that all the penal advantages of the old treadmill system may be regained, with better economic results than with the factory system, by attaching dynamo-electric machines to the cranks, and storing electrically the energy developed. In this way the prisons and penitentiaries would be converted into sources of brute energy to be sold for outside use in running machinery, electric lighting systems and the like. Blackwell's Island, for instance, now maintained at great cost as a harbor of refuge for drunkards and other petty offenders, sent up for ten days or a month at a time, would become a valuable source of convertible power to be sold for industrial uses. The "rounders" might not like the place so well, but the honest public would like it better. Ten days in the treadmill would sober off a "beat" as effectually as ten days of idleness, and in the interval he might help to store up many "foot-tons" of available energy. With prisoners under long sentences the plan might not be so profitable to the State, but it would obviate what is becoming the source of much social and political controversy. Skill wisely directed is worth more than mere energy, and a good boot or hat may sell for more than the energy the maker could store up in the same time in a Plante cell by turning a crank. But the storage cell would never give offense to the citizen who was trying to support a family by the voluntary production of boots or hats, while the indirect economy that would flow from a simplification of prison work, with the prompter utilization of the strength of criminals of all grades and conditions, might more than make up for the loss through the less profitable employment of a few skilled hands.

Oil and Mineral Deposits at Mendoza, South America.

A correspondent residing at Mendoza, the capital of the province of the same name of the Argentine Confederation, calls attention to the promising deposits of minerals and mineral oil in that little known region. Mendoza lies close to the Chilian frontier at the foot of the Andes, in latitude 33° south, longitude 69° west. It is soon to be brought into closer communication with the coast and rest of the world by the nearly completed Andean Railway. The mineral deposits close to the city are described as immensely valuable, yet almost entirely neglected. The opening up of steam communication will make the region, our correspondent thinks, an exceedingly promising one for investment and enterprise.

The petroleum deposits are found at the foot of the first spurs of the Andes, on an open plain, about ten leagues southwest from Mendoza, at a place called La Sierra de Cacheuta. Some of the oil collected on the surface of the ground showed on analysis:

Volatile combustible matter	91·66
Fixed carbon	7·24
Ash	1·10

As all the kerosene used in the republic is imported from the United States, it is believed that a refinery at Mendoza would find it easy to command the large home market, and be able also to export largely to the adjoining republics of Chili, Peru, Bolivia, etc., and to the Brazilian Empire. The price of kerosene at Mendoza is $5 a can.

In the immediate vicinity of the oil springs, precious metals are found in considerable quantities, and a large amount of silver is extracted in a desultory sort of way from a mine close at hand.

The climate of the region is temperate and salubrious, and allows the production in perfection of all European grains and fruits.

Lubricator Litigation.

In a paragraph in our number for July 22 last, it was inadvertently stated that in the suit of the Detroit Lubricator Company against a concern styled the American Lubricator Company, the verdict was in favor of the latter. It should have stated just the contrary. The verdict was in favor of the Detroit Lubricating Company, fully confirming and sustaining their rights. The suit was brought in the United States Court, Eastern District of Michigan, Justice Mathews presiding. The patent of the Detroit Lubricator Company, sustained, as above stated, by the Court, was granted May 22, 1877, number 191,171. The invention has proved to be very valuable in the economy of the steam-engine, and is being very extensively adopted. Persistent attempts to infringe appear to have been made by the concern styled the American Lubricator Company, who carried the folly so far that they continued their infringements after a verdict and an injunction was obtained against them; the final result being that the principal members of the concern were brought up before Judge Brown, of the U. S. Court, in February last, adjudged guilty of contempt, and fined, besides having to pay costs.

A Ride through the Thames Tunnel in a Phosphorescent Railway Carriage.

At the present time a railway carriage painted inside with the Balmain phosphorescent paint, is included in the train which leaves Liverpool Street station for Rotherhithe, *via* the Thames Tunnel, at 11 3 A.M. Although only one-half of the available space of the carriage is painted, the phosphorescent light is quite sufficient to enable the passengers to distinguish small objects when passing through the tunnel; and, moreover, the light is powerful enough to enable a person to read the indication of an ordinary watch. It is probable that the railway companies will be enabled to effect a considerable saving in gas and oil by using the phosphorescent paint.

Recovery from Rabies.

On more than one ground the possibility of the recovery of dogs from attacks of rabies is of great importance. The demonstration that this terrible disease is not invariably fatal, even in the animals most prone to it, may at least be welcomed as affording a ray of hope for therapeutics, while the fact of the recovery of affected animals may afford an explanation of many mysterious outbreaks of the disease. M. Decroix lately communicated to the Académie de Médecine nine cases which he had collected of well-authenticated recovery from rabies. (1) M. Ménecier inoculated two dogs and a rabbit with the saliva of a rabid dog; all three died from rabies, but the dog from which the saliva was obtained recovered. (2) Decroix inoculated a dog with the saliva of one suffering from rabies; the latter died, the former became affected with characteristic rabies and recovered. (3) Some saliva was obtained from a man some hours before he died from hydrophobia, and with it a dog was inoculated; the animal presented well-marked symptoms, but recovered. (4) Reg of Lyons recorded the recovery of a dog with furious rabies, due to a bite from another rabid animal. (5) A military veterinary surgeon, Laquerrière, has recorded the case of a dog affected in consequence of a bite from an animal unquestionably rabid. The destruction of the dog was ordered, but the owner refused consent, and the dog recovered without treatment. The four remaining cases were of recovery from rabies, in man in three cases, and in the horse in the last. Decroix points out that in furious rabies the attacks increase in frequency and intensity during two or three days, then attain their maximum, and disappear in two or three days more, whereas death does not occur until the fifth or sixth day. The eminent authorities who have never met with an instance of recovery are scarcely justified in denying the occurrence of such cases described by those practitioners who have seen them. The Rabies Committee, of which M. Decroix was president, has made, since 1874, a host of experiments with various substances of reputed value in rabies, three of them with pilocarpine, and every supposed remedy which they employed appeared actually to hasten death by the violent paroxysms which it caused. The conclusions of M. Decroix are that it is experimentally demonstrated that rabies may terminate in spontaneous recovery. Up to the present day no agent has made good its claim as a remedy for rabies. The cases of recovery attributed to this or that agent may be, with equal justice, ascribed to the spontaneous termination of the disease. The dogs which recovered in the experiments carried on by the committee were left at rest, and, since the administration of medicines usually provokes convulsive seizures, it seems desirable, according to our present knowledge, to leave persons affected with the hydrophobia in the most perfect possible calm, trying experiments only upon animals. In absolute quietude and obscurity the paroxysms are far less terrible than when medicines are administered, and M. Decroix asserts that if these conditions could be secured, he would far rather suffer from hydrophobia than from many other disease. It may, however, be observed that we are scarcely justified in drawing, from the superior results of therapeutic inactivity in dogs, the same lesson in the case of the disease in man. The administration of a drug to the human sufferer by the skin or rectum, or sometimes even by the mouth, may be effected with far less disturbance than in the case of the dog. Without doubt, however, he is correct in insisting on the absolute importance of perfect tranquillity, and of the avoidance of everything which may in any degree help to excite the paroxysms. It may be doubted also whether dogs are the best subjects for therapeutic experiments, since it is probable that the conditions met with in the human subject obtain more closely in the herbivora than in the carnivora. It is very desirable, in the case of any recovery from rabies, that it should be ascertained at what date the saliva ceases to be infectious, and whether the disease can be communicated after the animal has to all appearance recovered. This is a not improbable explanation of the occasional alleged occurrence of the disease from the bite of healthy animals.—*Lancet.*

Is the Gila Monster Venomous?

In the SCIENTIFIC AMERICAN of December 20, 1879, there was figured for the first time the large lizard known in Arizona as the gila monster, and to science as *Heloderma suspectum* (Cope), or *horridum*. Among the Mexicans this reptile is supposed to be venomous, and marvelous stories are told of its pestilent breath. Our naturalists, however, declare the animal to be harmless. From the account of the specimen that has recently reached London (see page 135) it would appear that the naturalists of the Zoological Gardens there are satisfied that the reptile has a mouthful of teeth all supplied with venom. The evidence given in support of that view, however, is not at all convincing. It is to be hoped that the matter will now be more fully investigated. It is barely possible that our American naturalists have prejudged the case.

EFFECTS OF LIGHTNING.—During a recent heavy thunderstorm in the Shetland Islands, which lasted several hours, a hill three miles from Lerwick was struck by lightning, and large masses of rocks and *débris*, estimated to weigh 400 tons, were thrown down on to the public road immediately below and stopped the traffic. At the spot where the lightning struck there is a deep rut extending down the face of the hill.

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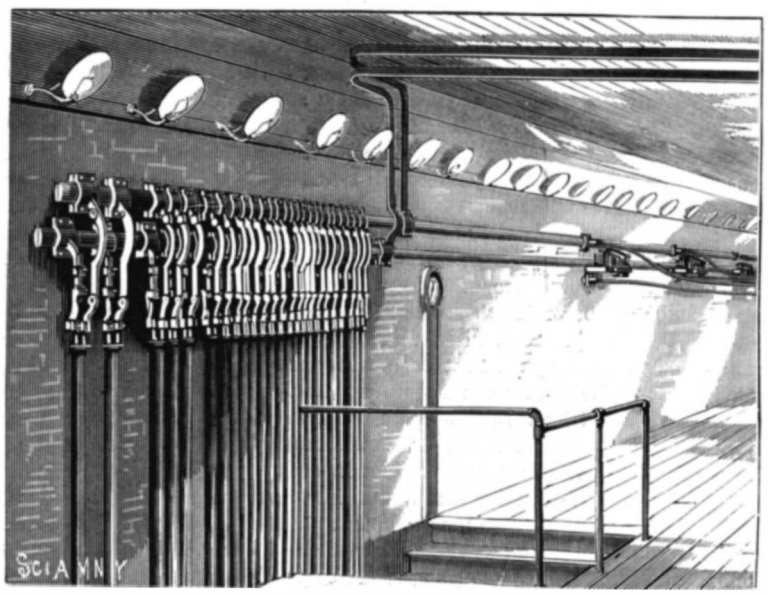
THE EDISON ELECTRIC LIGHTING STATION.

(*Continued from first page.*)

being inclosed in an iron pipe. At the adjacent ends of these sections of double conductors there are boxes which perform the double function of expansion joints to permit of the free expansion of the individual lengths of conductor, and of service boxes from which to take the electric current to the premises of the consumer.

While the blocks in this district were being encircled with these bands of copper, the buildings of the district, with scarcely an exception, were being fitted with wires leading to the sockets intended finally to receive the "electroliers" and single lamps, and to such localities as are to be supplied with the electric current for motive power. Simultaneously with all these preparations, the machine works of the Edison Electric Light Company in Goerck street were completing as rapidly as possible the gigantic dynamos to be used in supplying this district with the current, while the Porter-Allan Engine Company of Philadelphia was building the high-speed 120 horse-power engines to be used in driving the dynamos.

Now the street conductors are laid, the service conductors are put in, the buildings are wired, the dynamos with their attached engines are in place, and the district and central station are fully equipped, and we have no doubt that before this paper meets the eye of the reader the district will have been illuminated.



STREET CONNECTIONS.

Although we have many times given the various steps of progress made in this great enterprise, it will, doubtless, be of interest to enter somewhat into detail in describing the appointments of this illuminating station. The building, as we have said, was originally erected for commercial purposes, and, as might naturally be supposed, it was found to be totally insufficient in strength to sustain the great weight of the dynamos and their attached engines. Consequently a separate structure was erected within the walls of the building. It consisted of iron pillars planted on heavy plates resting on three feet of solid concrete, and supporting iron trestle work, carrying the heavy iron girders on which the machines were placed. The building is 5[illegible]x100 feet, four stories high, and divided by a median wall into two equal parts. It is in one of these parts that the machinery is placed. The other part is soon to be fitted up as a duplicate of the one already completed. Beginning with the basement, the area in front, underneath the sidewalk, is used for the reception of coal and the discharging of ashes from the boiler furnaces. In this place there is a special engine of about twenty horse power for driving the screw conveyers that carry the coal up over the boilers and deliver it to the stoke-hole between the boilers, and the screw conveyers that take the ashes and deliver them to barrels under the sidewalk in Pearl street. This engine also drives the fan blower which supplies air to the boiler furnaces, and also to the stoke-hole to keep it cool and well ventilated. Pipes also lead from the main air trunk of this blower to the dynamos on the floor above.

The boilers—of the Babcock and Wilcox style—four in number, are 250 horse power each. They all feed into a single 8-inch supply pipe, from which steam is taken through vertical 5 inch pipes to the engines above.

A gallery extends over the boilers and stoke-hole, from which the visitor may gaze into the depths below.

Each boiler is provided with an injector, and a steam pump is provided with connections for each boiler, so that any or all of the boilers may be fed by it. Water is supplied to the boiler at a temperature above 212°, being forced into a heater that receives the exhaust of all of the engines. By heating the water to this temperature before admitting it to the boilers the impurities are deposited, and the boilers are supplied with pure water.

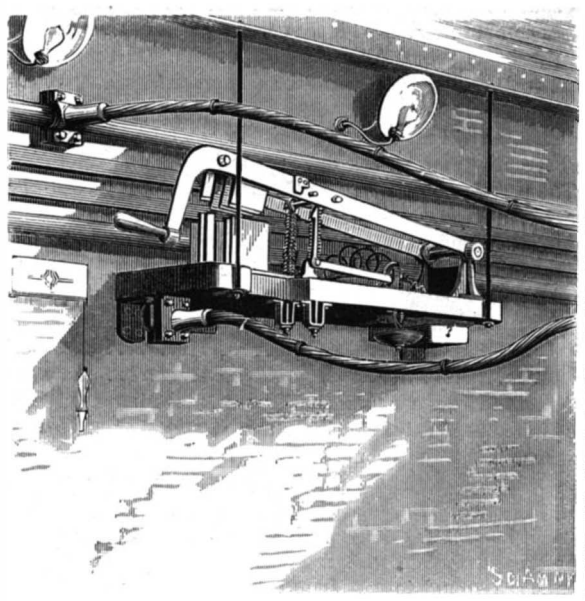
Over the boilers is supported the dynamo floor by the trestlework, entirely disconnected from the main building or its foundations. On this floor are six of the largest Edison dynamos. The gigantic proportions of these machines will be appreciated by reference to our engraving, although one can scarcely realize their immense solidity and weight without personal inspection. Each machine complete, with engine, dynamo, and base, weighs 62 000 pounds. The field magnet weighs 33,000 pounds. The armature at its shaft alone weighs 9,800 pounds. The length of the armature is 61 inches; its diameter, 27·8 inches. The height of the machine from the floor to the top of the field magnet is 6 feet 4 inches.

The engine whose shaft is coupled directly with the dynamo shaft is upon a base which is common to both engine and dynamo. The cylinder of the engine is $11\frac{3}{16}$ inches in diameter, and the stroke is 16 inches. The cut-off of the valve is variable by the governor.

The normal speed of the engine is 350 revolutions per minute, steam pressure 120 pounds. With this great velocity it is found that both engines and dynamos are so perfectly balanced as to scarcely create a tremor in the trestle work upon which they rest.

The nominal capacity of each of these dynamos is 1,200 lights of 16 candle power each, but the maximum capacity is about fifty per cent in excess of this. The resistance of the armature is 0·0038 ohm, and the current generated by the machine is of such low intensity that one may grasp both conductors leading away from the machine without danger and without serious inconvenience.

The dynamos are arranged alternate in position with each other so as to economize room, three of them being connected by heavy copper conductors with the large copper bars extending along the sides of the room. The bars of like name from opposite sides of the room are connected together at the front of the building, where the entire current from all of the machines is centered in two large horizontal copper bars, with which the several street conductors are connected, as shown above, one of the parallel street conductors being connected with each of the dynamo mains. In the conductor extending from the dynamos to the rods along the walls there is a huge switch (shown in detail in one of the smaller engravings), having three contact surfaces about four inches broad which wedge between three pairs of fixed contacts. By means of this switch the circuit of any dynamo may be instantly broken. The size of the various conductors vary with the requirements. The street conductors are equal to a copper rod of one-half inch diameter, and the service conductors vary, some of them being equal to two and others to ten No. 10 wires. Of the street conductors there are something over fourteen miles altogether. The field magnets of the dynamos are placed in a shunt circuit derived from the main circuit, and including a switch and a number of rheostatic coils, one or more of which may be thrown into the shunt circuit, so as to add to the resistance of the shunt circuit from a small fraction of an ohm to seven and a half ohms, which is the greatest resistance necessary to control the current exciting the field magnets, and thus control the current in the main circuit. This regulating apparatus is shown in one of the views on our title page.



THE SWITCH.

There is a set of resistance coils for each dynamo, each set being provided with a circular switch, operated by a horizontal shaft through sets of miter gearing. An attendant is stationed at the wheel at the end of the horizontal shaft, and turns the switches one way or the other, according to the requirements. He is able to judge of the amount of current required by watching an indicator above the regulator. This indicator is provided with two lamps, one red and one blue, and with a device for throwing one or the other of them into the circuit, according as the current is strong or weak; and neither lamp is illuminated when the current is normal. When the blue lamp is lit more resistance is required in the shunt circuit to reduce the amount of current passing through the wires of the field magnets, consequently the attendant turns the switch, throwing in one coil after another until the blue lamp ceases to shine. When the red lamp shines, the switch must be turned in the opposite direction to increase the power of the field magnet and to strengthen the current in the main circuit.

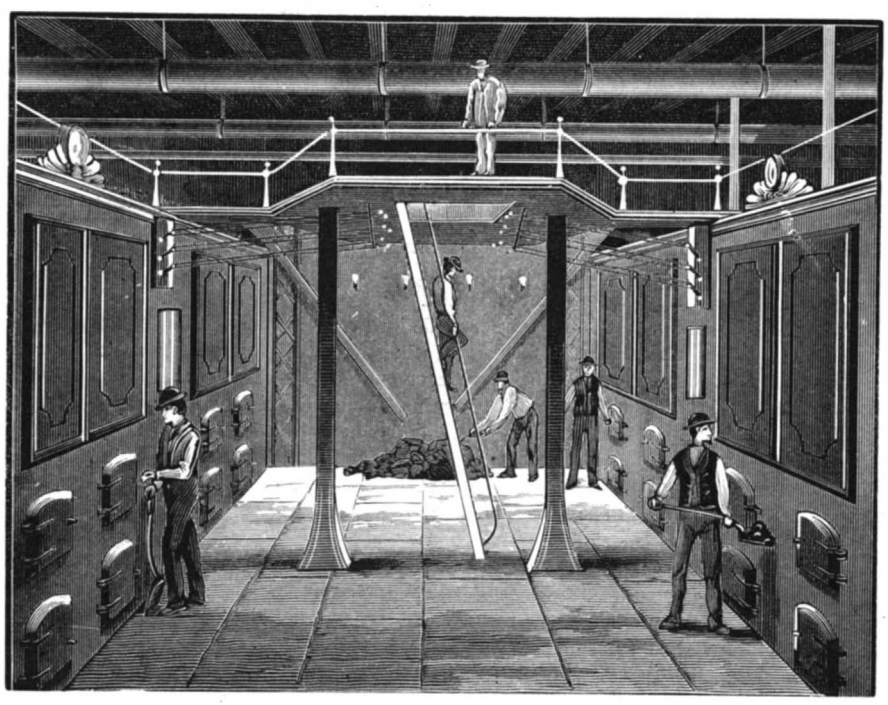
As before mentioned all of the dynamos work in the same circuit when everything is normal, but if from any cause it is supposed that one of them is not doing its work properly it is immediately disconnected from the main circuit by letting go the huge switch by which it is connected with the main conductors. The switch is provided with a strong spring that opens it instantly as soon as it is released. The isolated machine is now connected with a battery of a thousand 16 candle lamps arranged in two rectangular groups in one of the upper rooms of the building, as shown in one of our engravings. If the machine brings these lamps to brilliant incandescence, it is in usable condition, and if any trouble exist it must be looked for elsewhere.

On one of the upper floors of this building is a room for testing the meters employed in registering the amount of current used by the consumer, and for taking a record of the meters, the amount of current used being determined by the amount of copper deposited by the meter in a given time on one of its plates.

This electric lighting station is very complete in all of its appointments. Every imaginable emergency has been provided for: coal bunkers in the top of the building to hold a reserve of coal, water tanks to supply water in case of any deficiency or cessation of supply, thorough protection against fire, and thorough workmanship everywhere.

For convenience in handling the heavy parts of the machines, the dynamo room is provided with a traveling hoist capable of running the entire length and breadth of the room, and having power enough to easily lift the heaviest part of any machine and of holding or carrying it as may be required.

The projectors of this gigantic enterprise have met with no adverse experiences, all the tests thus far made proving entirely satisfactory.



BOILER ROOM.—STOKE HOLE.

Glass Coating on Metals.

The following method has been suggested for coating metal surfaces with glass, which may be found to answer various purposes: Take about 125 parts (by weight) of ordinary flint glass fragments, 20 parts of carbonate of soda, and 12 parts of boracic acid, and melt. Pour the fused mass out on some cold surface, as of stone or metal, and pulverize when cooled off. Make a mixture of this powder with silicate of soda (water glass) of 50° B. With this coat the metal to be glazed, and heat in a muffle or other furnace until it has fused. This coating is said to adhere very firmly to steel or iron.

THE Willimantic (Conn.) Linen Company has posted the following notice in its mills: "No person now in the employ of the Willimantic Linen Company will be continued in their service after July 4, 1883, unless they can both read and write. And on and after this no person will be hired by the company who cannot both read and write."

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PICTET'S SMALL ICE-MACHINE.

The small ice-machine shown in the accompanying cut is designed to produce small quantities of ice at a time. It is capable of operating intermittingly and produce a kilogramme of ice in about fifteen minutes, or continuously and give 4 to 5 kilogrammes per hour, with an expenditure of power always below that of a one-horse power steam engine. It is adapted, then, for use on steamboats, in country seats, in colonial dwellings, in agricultural industries, and in all cases where it is easy to take a horse from his ordinary work, or to use him when idle, long enough to effect the operation; in a word, it is applicable in all cases in which there is a motive power at one's disposal, and in which the only means of obtaining ice economically is to manufacture it one's self.

The apparatus is not very different in principle from Mr. Pictet's large ice-machines which we have already made known. It is merely very much simplified so as to supply the special wants of the new applications for which it is designed.

The apparatus consists essentially of a compressing pump actuated by the motor; of a congealing refrigerator, with a condensing tank that also surrounds the cylinder and pump; and of a congealing refrigerator in which are placed the moulds filled with water to be frozen. All these parts and their accessories—suction valves, frame, driving shaft, gearing, etc.—are skillfully grouped so as to occupy but a very limited space, inasmuch as the bed plate is only 50 centimeters square, and the total height does not exceed 1·3 meters. The operation of the apparatus may be readily understood. At the beginning the sulphurous anhydride is in the congealing refrigerator. The pump sucks it up, and evaporation absorbs a large quantity of heat from a solution of glycerine in the refrigerator, and from the moulds filled with water placed in the glycerine. The anhydride is afterward forced by the pump into the condenser, where it liquefies, and gives up to the water in the condensing tank a certain quantity of heat. The colder this water of condensation is, the less the work demanded by compression. The anhydride, then, constitutes an intermedium, which permits, after a manner, of *drawing heat* from the congealer and *pouring* it into the condenser. When the apparatus is operated continuously, it becomes necessary to keep the condenser at a low temperature, this being easily done with a circulation of 200 liters of water per hour in the condensing tank. When the operation, which requires from twelve to eighteen minutes, is finished, the moulds are removed from the congealer, and a distributing cock is opened so as to allow the liquefied anhydride in the condenser to run into the congealer. In about a quarter of a minute the former communication is again established, and the machine is then ready to begin operations anew.

All that the apparatus demands, then, is motive power, since it is closed up, and the anhydride describes a complete cycle at each operation. The duration of the initial change of sulphurous anhydride is indefinite. In practice it depends only on the degree of tightness of the joint of the piston-rod stuffing box.

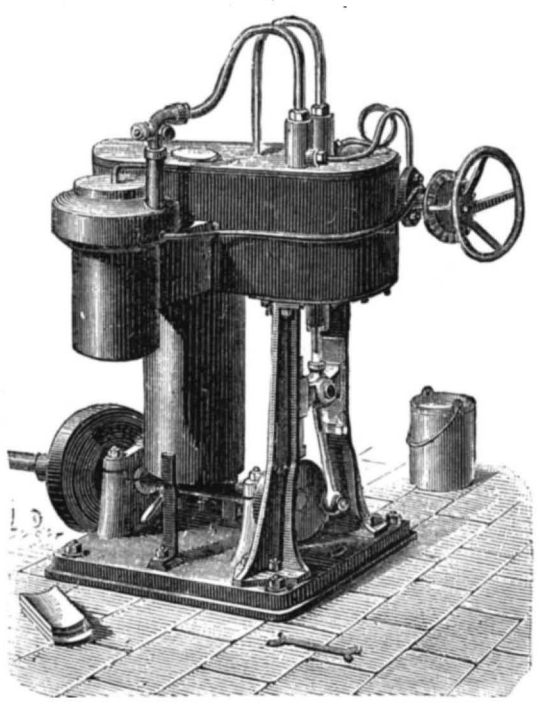
The ice produced in the moulds is in the form of three slightly curved layers, which are afterward superposed so as to make a single compact block, weighing one kilogramme.—*La Nature.*

Incandescent Gas Lights.

The vestry of Clerkenwell have decided to give trial to a new system of gas illumination, introduced by Mr. J. Lewis, of 12 Clerkenwell Green. In this system the old gas burner is discarded, and its place is taken by a thimble or basket of platinum wire gauze inverted over the end of the supply pipe. The coal gas is mixed with compressed air by means of an air-pump, and the mingled gases pass to the platinum gauze, and escape through its meshes. They are lit on the outside, and the wire speedily becomes white-hot. The total combustion of the gas is further assisted by the draught up two side pipes branching from the main supply pipe below the burner and curving downward. The appearance of the incandescent thimble is very pleasing, and the light is brighter, softer, and steadier than a gas flame. No flame is seen above the incandescent wire, and there appears to be total combustion of the gas. The lighting power of the system is said to be 5¼ candle power per cubic foot of gas consumed. A similar plan has been brought out in France by M. Clammond. In this a mixture of gas and heated air is employed, and the gas is burned in the meshes of a platinum basket as above. The air slightly condensed arrives at the burner by a separate pipe to that of the gas, as in Mr. Lewis's arrangement, but it is likewise passed through a tube of refractory material heated to 800° C. or 1,000° C. by means of a number of small gas flames round it. After this heating it is allowed to mingle with the coal gas and proceed to the burner. A horse power of work expended in condensing the air is stated to do for an illumination of 200 Carcel lamps, and one Carcel lamp requires from 0·95 to 1·6 cubic feet of gas according to the burner. The latter has to be replaced every forty or fifty hours. A modification of the platinum burner is also provided for replacing the chalk cylinder in the oxyhydrogen light, and adapted for stage and lecture purposes. Dr. Regnard has further adapted the platinum cage to a petroleum lamp. In this case the compressed air is supplied by a hand-bellows or a bag filled with air and loaded with weights. The air passing over the petroleum oil in a reservoir mingles with the vapor, and the mixture passes to the platinum cage, where it is burnt. While upon this subject we may also mention a new arrangement whereby a strip of platinum foil is passed through a gas flame and traversed by the electric current. It is stated that a light equal to thirty candles can be obtained from two cubic feet of gas per hour by help of a very weak current.—*Engineering.*

An Army in Blue Specs.

It is said that Arabi, the general of the Egyptian revolutionary forces, is going to be very circumspect and hold his ground quietly, expecting that the English army will soon be disabled by ophthalmia, without the need of fighting. The

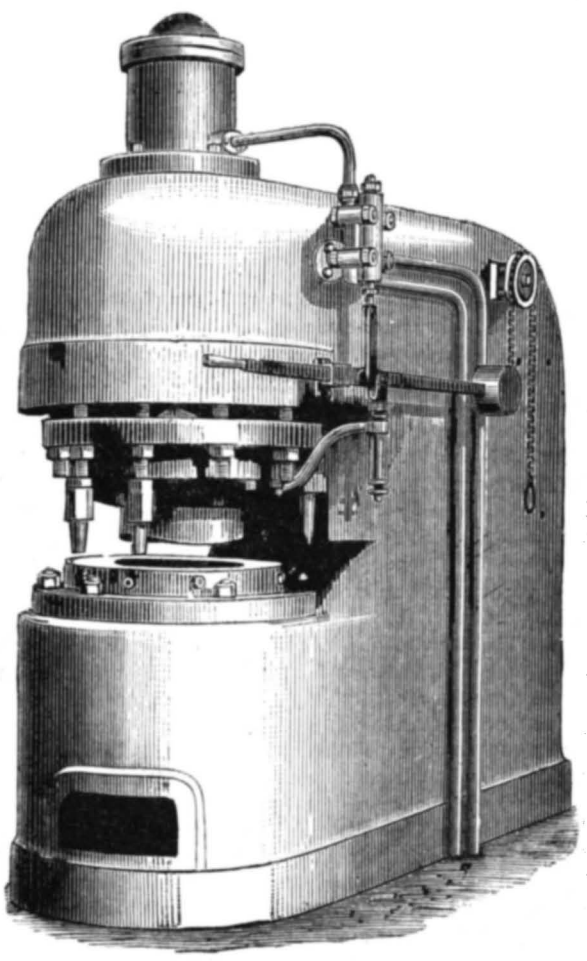


PICTET'S SMALL ICE-MACHINE.

glare of the sun and the fine sand that floats in the air have been found to play the mischief with foreign soldiers. It is affirmed that during the Egyptian campaign of the great Napoleon two-thirds of his men were at one time distressed with eye diseases. According to the English papers, every precaution is to be taken to save the British troops, now pouring into Egypt, from such maladies; and among other speculations, 25,000 pairs of blue spectacles have been purchased at five cents per pair. Probably Arabi will laugh at the spectacle of an army in specs; but blue glass is held to possess various healing virtues, and if the British expectations are realized, they will yet laugh at Arabi.

HYDRAULIC PUNCHING MACHINE.

The engraving illustrates a very large punching machine, constructed by Mr. R. H. Tweddell, of Delahay street, West



HYDRAULIC PUNCHING MACHINE.

minster, for Messrs. Raylton, Dixon & Co. It is intended for stamping out manholes in marine boiler plates at one operation, and will stamp a hole 18 inches by 14 inches in a ¾ inch plate. It weighs 14½ tons. The machine is so simple, and its construction is so clearly shown in our engraving, that we do not think any special description is necessary.

Modern Improvements in Glass Making.

The following is a record of the principal improvements in glass making during the last fifty years, as given by a prominent manufacturer:

Robert Lucas Chance, of Birmingham, England, successfully introduced the manufacture of Bohemian sheet glass into his district in 1838. James Chance perfected the process of grinding and polishing sheet glass, now known as patent plate.

The substitution, about the year 1830, of carbonate of soda, as the alkaline ingredient in glass in place of kelp, and subsequently, for crown and sheet glass, of sulphate of soda (saltcake) in the place of carbonate.

An increase in the size and improvement in the workmanship of the plates, sheets, and tables produced.

An improvement in the color of the glass by the use of purer materials and modifications in the process of melting.

Numerous improvements in the flattening of sheet glass, resulting in the removal or diminution of many imperfections.

The use of the diamond in the process of splitting cylinders in the place of a red hot iron.

An increase in the size of the melting pots and furnaces, with the view of economizing coal and labor.

The adoption, in the casting of plate glass, of various mechanical contrivances. The origin of some important improvements of this class is due to the manager of the Birmingham Plate Glass Works.

The use of the same pot for the two processes of melting and casting plate, superseding the old method of transferring the contents of the melting pot into the vessel used for casting.

The substitution of small coal, or slack, in the melting processes in the place of the large coal or lumps.

The application of Siemens' regenerative process to the melting of glass, by which the amount of smoke is greatly diminished, the color of the glass is improved, a greater control is obtained over the furnace, and a saving of fuel is effected wherever, by this process, slack can be substituted for large coal or lumps. These advantages are to some extent counterbalanced by the increased cost of the furnace, and its increased liability to get out of order. The process, however, as applied to glass making, is so new that there has been scarcely time as yet to overcome the difficulties that have presented themselves.

The introduction of the Gill furnace, whereby coal is economized to a remarkable extent without sacrificing the effectiveness of the combustion or the evolution of heat.

There have been many improvements, besides, in machinery for pressing and ornamenting glassware, but they are too numerous and intricate to detail here. The most important of these, too, have had their origin in the United States, which have rapidly come to the front with labor-saving devices in glass manufacture as in other industries.—*Pot. and Glass. Reporter.*

Fireproof Cement.

A fireproof cement is being introduced made from a material found in the Eifel Mountains. It is alleged by eminent professional men to be the only material known to science which possesses besides its plastic qualities the virtue of being fireproof. Moistened with water, this cement forms an elastic mass, which can be exposed when dry to great heat without shrinking or showing any cracks. Such a cemet should be peculiarly adapted for repairing defective fireplaces, cracks in retorts, etc., as mortar for fireproof buildings, and for the interior plastering of furnaces. The mode of its preparation is as follows:

The cement is to be well mixed in a dry state, a small quantity of water is added and mixed well together. As a mortar it can be used in the ordinary way. In lining furnaces, however, care must be taken to press the cement well into the walls, so as to leave a smooth, even surface, as when dried by the air the cement easily crumbles and will not harden till ignited. Moreover it must not be treated roughly until it has been well burnt. Cracks in furnaces, retorts, etc., should be well cleansed and scraped, and if possible roughed before applying the cement. The parts to be mended should be damped beforehand.

An analysis by Dr. Bischof, of Wiesbaden, gives the following results:

The cement is a pale gray, gritty substance, consisting of a good deal of fine dust, with angular and round particles of quartz. When mixed with water it is very sticky, compact, and easily moulded. In 100 parts of the material dried at 120° C. there were:

Clay earth	10·18
Silica, chemically combined	11·03
Silica, mechanically mixed (sand)	73·58
Iron oxide	0·41
Lime	0·23
Magnesia	0·17
Potassium	0·99
Loss by heat	3·46
	100·05

As will be seen, the quantity of fusible matter such as iron, etc., is very small indeed, if any. Under the fire treatment the cement showed the following results: After being heated to silver smelting heat, or about 1,000° C., the cement turned to a gray color, speckled with a few black spots, the fracture being earthy and porous.

To remove smoke stains from ivory, immerse the pieces in benzine, and go over them with a brush.

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The Ammonia in the Atmosphere.

Hitherto the quantity of nitrogen which the soil obtained from the atmosphere was estimated by determining the quantity of ammonia and nitric acid in rain water. A few years ago Schloesing proved, however, that rain water only carries down the nitrate of ammonia, while carbonate of ammonia is only partially precipitated with the rain, another portion always remaining in the atmosphere. Of this latter ammonia a certain quantity is directly absorbed by the soil, and, since it is there oxidized to nitric acid, the soil always remains capable of taking up some more ammonia, and he calculates that 63 kilos of nitrogen are conveyed to the earth annually in this way on each hectare of surface.

We know already from our daily experience that the absorption of this ammonia, so important to the nutrition of plants, is not the same on all soils, for sandy soils require a more frequent application of nitrogenous manures than do the clay and loam soils. It was, therefore, of great practical interest to ascertain just how much ammonia the different soils were able to abstract from the atmosphere in the course of a year. The first experiment in this direction was made by R. Heinrich, who sought to determine the maximum amount of ammonia that any kind of soil could absorb from the atmosphere, and he thought to ascertain this with greatest certainty if he used an aqueous solution of hydrochloric acid to absorb it.

The experiment was continued for two years in the following manner: A 20 per cent solution of hydrochloric acid was exposed to the open air for a month in a glass vessel, 5 centimeters (2 inches) deep, with a surface equal to 78·5 square centimeters (over 12 square inches). When it rained the glass was covered so as to keep out the water, but permit free access of air and wind. The vessel stood on the green sod of a field, over forty yards from any buildings, at the experimental station of Rostock, and two-thirds of a mile from the nearest houses in the city. The shores of the North Sea are about seven miles northward from this station. At the expiration of each month the acid was evaporated and the sal ammoniac weighed.

The results of Heinrich's two years of observation have been tabulated, and all the more important meteorological data added. Toward the end he also determined the quantity of ammoniacal nitrogen contained in the rain and snow water. The numbers in these tables show, first, that the amount of ammonia absorbed by the given surface of acid liquid is very different according to what season of the year it is examined. The mean value of both years showed 24·068 mg. nitrogen absorbed by the soil as ammonia in a year. The amount in winter was 2·912 mg. nitrogen; in spring, 6·712 mg.; in summer, 9·766 mg.; and in autumn, 4·678 mg. From this the relation is seen between the absorption of ammonia and the temperature, and it is seen more distinctly in certain months. If the month shows a steadily rising temperature the absorption is higher relatively than in months that are just as warm, but have the temperature falling.

If, however, the warmer months are those which show the highest absorption of ammonia from the atmosphere, then it would not do to draw conclusions for the whole year from observations made during a few weeks in summer, as Schloessing has done.

What was most striking about the numbers in the table was the small amount of absorption during August, 1881, in which time the weather was unusually calm, and there were no south or southwest winds.

From the quantity of ammonia absorbed with different directions of the wind it can be seen (as might be anticipated) that the ammonia in the air does not come from sea, but rather from the air passing over the solid land.

It would not be reasonable to draw any conclusions as to the total quantity of ammonia that the soil gets from the air, based upon the quantity absorbed by such a small surface of hydrochloric acid. Nevertheless it is interesting to compare these numbers with those found by Schloesing. This small surface of 78·5 square cm. absorbed 26 mg. of ammonia per year, hence a hectare of surface would absorb 30·6 kilos per year of nitrogen. Schloesing concluded from his experiments that it would be 63 kilos. If we took the June average for the whole year we should get 48·732 mg. for our small surface, equivalent to 62·1 kilos per hectare, which is nearly the same as given by Schloesing. On the other hand, taking the February average, it would make only 15·1 kilos a year. These numbers prove that any determination of the absorptive power of soils for ammonia in the atmosphere must be continued throughout the whole year to get at the true absorption.—*Forschungen auf dem Gebiete der Agriculturphysik.*

Ancient English Oaks.

Among the ancient oaks of England few are more interesting than the gigantic ruin now standing in an arable field on the banks of the Severn, near Shrewsbury. It is the sole remaining tree of those vast forests which gave Shrewsbury its Saxon name of Schobbesburgh. The Saxons seized this part of the country A.D. 577, when they burnt the Roman city of Uriconium, where Wroxeter now stands, four miles from the village of Cressage; and underneath this now decrepit dotard it is said that the earliest Christian missionaries of those times—and possibly St. Chad himself—preached to the heathen before churches had been built. The Cressage Oak—called by the Saxons Criste-ache (Christ's Oak)—is probably not less than fourteen centuries old. The circumference of the trunk was about 30 feet, measured fairly at a height of 5 feet from the ground; but only about one-half of the shell of the hollow trunk now remains. It still bears fifteen living branches, each 15 feet or 16 feet in length. A young oak grows from the center of the hollow.

The noted oaks of England, thanks to those who have preserved them, thanks to the universal veneration for timber, and to a stirring and lengthened history, are innumerable. Windsor Forest is particularly rich in historic oaks, and Sherwood Forest, though disafforested, still contains some memorial timber, like Needwood, once a crown forest, now a fine estate of well-farmed land. Dryden's

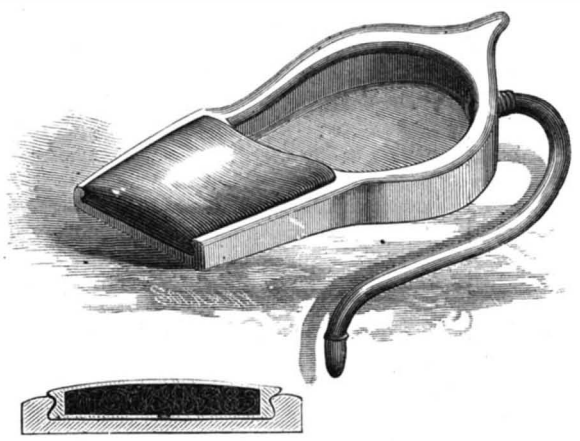
> "Three centuries he grows and three he stays,
> Supreme in state, and in three more decays."

is a poetical statement, and some of the dates on trees cut down in Sherwood Forest, and marked 600 years before, in the time of King John, prove that it is an under-estimate. The great Winfarthing Oak, in Norfolk, was called the "Old Oak" in the time of the Conqueror, and has been supposed to have attained the age of 1,500 years. The King Oak in Windsor Forest is upward of 1,000 years old.—*The Gardeners' Chronicle.*

IMPROVEMENT IN BED-PANS.

The engraving shows in perspective and in transverse section an improved bed-pan recently patented by Mr. Walter F. Morgan, of Leavenworth, Kan.

The earthenware pan in common use is found to produce an uncomfortable and painful pressure upon the sacral region, which is more especially complained of by chronic invalids and irritable, sensitive patients. In using the hard bed-pan it has been found impracticable to supply a temporary cushion without decided inconvenience, and the soft pans do not seem to meet the popular demand because they are very expensive and not durable. The engraving shows a cushion



IMPROVED BED-PAN

permanently attached to a grooved socket in the thin end of the pan. This cushion is made of soft rubber stuffed with curled hair, and is of such form as to protect the sacrum from uncomfortable pressure.

Rubber has been selected for the cushions because of its softness, durability, and cleanliness, and because it is impervious.

The pan is provided with a stoppered flexible tube, through which water may be removed from the pan when large quantities of it are used for injections or other purposes. This improvement permits of using the pan continuously for such purposes without removing it.

The Bombardment of Alexandria.

We had eight armor-clads engaged—the Inflexible, Alexandra, Sultan, Superb, Téméraire, Invincible, Monarch, and Penelope. These ships mounted four 81-ton guns, fourteen 25-ton, thirty 18 ton, and twenty-four 12-ton guns, besides smaller pieces, and Gatling and Nordenfelt machine guns. They were protected by armor-plating which varied in thickness from 24 in. to 6 in. The forts they attacked have been recently strengthened and made as powerful as they now are; but little is known of the character of their armaments. They are supposed to contain seven or eight 18-ton guns and numerous lighter pieces, but they are mainly armed with smooth bores, throwing solid spherical shot. These could do little damage to the armor of our ships, and, as a matter of fact, it is reported—although the present reports are very imperfect and vague—that they proved almost harmless.

The sum total of the injuries to our fleet, and the number of killed and wounded, are of the most trifling character considering the nature of the operation, and the fire they had to stand. The armor-plating of the ships—even the thinnest—was evidently of great value, and saved many lives and much injury to the machinery and fighting appliances. Our fire could not be affected by the shots which struck, and there was not the slightest danger of one of our ships being silenced by the enemy. On the other hand, the heavy projectiles hurled by our fleet at the forts—those of the Inflexible weighing 1,700 lb. each—speedily pulverized them, and put their guns *hors de combat.* Our fleet consists of ships, or fighting machines, the chief of which cost over three-quarters of a million sterling, and the greater part of ten years each to complete. They represent the very utmost which all the wealth, mechanical skill, and invention, and the enterprise of this country can produce for the purpose of guarding its interests at sea. It is not very wonderful that the result of so vast an expenditure of money and time as these ships cost should be the speedy destruction of forts hastily completed and imperfectly armed such as those of Alexandria. If a comparison were made of the exact relative strengths of the two opposing forces, and the time, labor, and cost involved in their production, it would be seen how absurdly unequal the contest was.

Three points have come out strongly in this bombardment which have an important bearing upon naval warfare. These are the great protective value of armor-plating to life, and to the machinery and fighting power of a ship; the necessity of making the heaviest guns the primary offensive weapons; and the difficulty of fighting with precision, and maintaining a watchful defense against small craft, through the smoke of an action. We have formerly pointed out that the thinnest armored ships are of great value, notwithstanding the fact that they may occasionally meet with guns which would render their armor useless. This plating is still able to resist the fire of the great majority of guns that can be brought to bear upon it; and it can deflect and keep out the projectiles of light guns which might be brought against it in great numbers. The thin armor of the Penelope and Invincible seems to have been able to protect those ships quite as effectively as the Inflexible's did her. Had they been unarmored, or "freely penetrable" ships, as Sir W. Armstrong advocated in his presidential address before the Institution of Civil Engineers, there would probably have been a great loss of life, considering the fire these ships were under, and a disablement of some or all of the guns. The Invincible, which cost a quarter of a million, has been practically of as great defensive value in this action as the Inflexible, which cost over three-quarters. This does not prove that she is as good a ship for all purposes, but it shows that for many operations, including the present, this thinly armored ship is as useful as any other, and is very much superior to an unarmored vessel. Till the heaviest guns, such as would render this armor valueless at long ranges, have been obtained by foreign powers in such numbers as to make them the common weapons of war, it is premature to call vessels with 8 in. and 6 in. of armor obsolete.

With regard to the position of guns in the class of offensive weapons it is clear that they must continue to hold the highest place. The ram and torpedoes, which are rightly advocated very strongly, are often of great value; but they are of no use in actions of this kind. It would be a mistake to build many ships in which guns are done away with, or reduced in power, in order to develop more completely the full efficiency of the ram and torpedo.

The difficulty of fighting the guns with precision, and of defending a ship against torpedoes and torpedo boats, will be very great after an action has once commenced, by reason of the accumulation of smoke and the time it takes to clear away. As soon as the ships began firing at Alexandria a bank of smoke is stated by the correspondents on board to have risen like a wall, and prevented the results of the fire from being watched. From the very commencement it was so dense that nothing could be seen of what the enemy were doing, and it was only the sharp scream of projectiles overhead, and the upleaping of columns of spray as the shot struck the water that made it clear the fire was being returned. Order had to be given to cease firing until the smoke cleared away. The wind and sun were both in the enemy's favor, and it was some time before the veil of smoke lifted sufficiently for even a glimpse of the shore to be obtained. This glimpse was lost the instant the guns again opened fire, and before it was possible to see where the shots struck. The only way to get a chance of seeing what was being done was by look-outs in the tops, but these are very frail refuges in a general action, and may easily be destroyed, and the look-out limited to the deck.

This smoke difficulty will give the opportunity for torpedoes, torpedo-boats, and any fast auxiliaries, in a general action. When the smoke has once accumulated these craft will run in and endeavor to close with the large ships before they can be seen. Under some circumstances, if a favorable state of the wind is taken advantage of by a torpedo boat a vessel may have no chance of protecting herself. For this purpose vessels are required larger than our present torpedo-boats, which could support themselves at sea for a time, and would be able to accompany a fleet and act as auxiliaries.—*Engineering.*

Carbolic Acid in Blood Poisoning.

The French surgeon, Declat, has recently been making some noise about his discovery of the value of hypodermic injections of carbolic acid in blood poisoning. He extends its value to scarlet fever, smallpox, typhoid fever, etc., and declares that the potent little syringe enables him to "laugh at" these diseases. This is the extravagance of enthusiasm. There is some value in the method, but a limited one. Nor was Declat its originator. Four years ago Dr. N. B. Kennedy, of Texas, used and wrote upon the advantages of these injections, and in April, 1881, he read a paper before the Texas Medical Association, in which he claimed priority of all others in its employment.—*Med. and Surg. Reporter.*

A TWO-MILE BRIDGE.—An addition has been made to the list of long bridges in the bridge of the Pensacola and Atlantic Railroad across Escambia Bay, Florida. It is five miles and a quarter long, and was opened for use August 15.

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RECENT DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of Indiana.

GOTTFRIED *vs.* THE CRESCENT BREWING COMPANY.—PATENT BARREL PITCHING.

Gresham, J.:

Letters patent, No. 42,580, issued to J. F. T. Holbeck and M. Gottfried, May 3, 1864, for a method of preparing casks for receiving pitch or other melted substance, to render them impervious, by forcing an air blast through a grate fire, the heated air and products of combustion being thence driven into the cask through a pipe leading from the top, examined and held to be invalid, whether construed to be for the use of a hot blast generally or for the use of a deoxygenated and non-combustible blast.

The invention is anticipated by the prior German publication, *Der Bierbrauer*, describing a method of drying the interior of casks or vessels by warm or hot air by an apparatus substantially like the plaintiff's in construction, mode of operation, and effect, and differing only in the particular that the hot air is drawn from the furnace through an exhaust passage by a fan located between the furnace and valve, and thence driven with the products of combustion into the cask. The applicant has merely applied the old devices to a new use.

Merely applying old and well-known mechanical contrivances to a new purpose will not support a claim for a patentable invention or process.

The patent in this case was not even for the application of an old machine to a new use, it appearing that the interior of moulds and casks had been previously heated by a hot blast for the same purpose, but by different means.

United States Circuit Court—Southern District of New York.

SCHNEIDER *vs.* LOVELL *et al.*—PATENT LAMP BURNER.

Blatchford, J.:

This suit is brought on reissue letters patent, No. 7,511, granted to the plaintiff, February 13, 1877, for an improvement in shade holders for lamps, the original patent, No. 182,973, having been granted to Carl Votti, as inventor, October 3, 1876.

One of the defenses set up in the answer is that in the specification of the reissue there is not given, as required by the statute, a description of the invention, and of the process of making, constructing, and using it in such full, clear, and exact terms as to enable any person skilled in the art or science to which it appertains to make, construct, and use the same; nor is there explained in or by said specification the principle of the alleged invention and the best mode in which said Votti has contemplated applying that principle so as to distinguish it from other inventions, and that therefore the patent is void.

A patent for an improvement in shade holders for lamps claimed, *inter alia*, a shade or globe so arranged and constructed that the burner performs its required functions without the use of a chimney, the specification affording no further explanation of the principle which is to govern the construction of the shade as to its size and proportions, and it appearing from evidence produced that a shade made of the shape, size, and proportions illustrated in the drawings would not give light when used alone to the same degree as when used with an ordinary chimney, and that the shades actually used by the patentee and the defendants were not the shade of the drawings, but were the result of further adaptation and experiment, *Held*, that the words "whereby the burner performs its functions without the use of a chimney" mean that the arrangement will give as good a light as with the use of a chimney.

That the most favorable view that can be taken of the patent is that it is for a shade of the size, height, and proportion shown in the drawings.

That as the defendants' shade was different from that shown in the drawings, it did not infringe.

United States Circuit Court.—District of Rhode Island.

WHITE *et al. vs.* HEATH.—PATENT LAMP.

Colt, D. J.:

This is an application for a preliminary injunction. The complainants, having acquired title by assignment to a certain patent issued to Charles S. Westland for an improvement in lamps, charge the defendant with an infringement. This patent (No. 206,061) was issued July 16, 1878.

The object of this invention was to avoid the danger from fire in the event of an explosion of a lamp in which kerosene or this inflammable fluid might be used, by means of a closed receptacle or chamber of glass or other fragile material charged with carbonic acid gas fitting about or into the oil reservoir.

A patent for the application of the power of carbonic acid gas to extinguishing flames in an ordinary lamp containing inflammable oil by means of a closed receptacle holding such gas is infringed by one who uses the main elements of the combination, but has made certain changes in the gas-holding receptacle—viz., alterations in form and location—whereby the receptacle is less liable to get broken, and at the same time the gas comes into more immediate contact with the flames in case of an explosion.

One who uses the combination secured by the patent is none the less an infringer because he has made changes in details of construction which might be patentable as improvements.

An injunction is seldom refused where exclusive possession is shown for some time, though not for a long period, where large and numerous sales have taken place without dispute, and where the validity of the patent is not questioned by the defendant.

Injunction granted before any sales had actually been made by the defendant where it appeared probable from the circumstances that the defendant is about to engage in the business.

The mere assertion of the defendant in the affidavit attached to his answer that he has no intention of making and selling any of the infringed articles during the pendency of the suit is not a good reason for withholding an injunction.

United States Circuit Court.—Southern District of New York.

COBURN *et al. vs.* SCHROEDER *et al.*

Wheeler, J.:

This cause has been further heard upon motion of the defendants to have the decree opened and leave granted to put in as further defenses to the patent an English provisional specification, left by James Ritchie Butchard, January 22, 1866, at the office of the Commissioner of Patents in England, with a petition for a patent, and other evidence of prior knowledge and use. The invention is understood to have been made in February, 1866. The introduction of the provisional specification would be unavailing unless it would bring the case within the third division of section 4,920 Revised Statutes—

"That it had been patented or described in some printed publication prior to his supposed invention or discovery thereof."

In *Smith vs. Goodyear Dental Vulcanite Company* (93 U. S., 416) the invention was found to have been made in the spring of 1855, and there was an English provisional specification and patent in evidence. The court, at page 498, on this subject said:

"Of the English patent of Charles Goodyear it is enough to say that though the provisional specification was filed March 14, 1855, the completed specification was not until the 11th of September following. It was, therefore, on the last-mentioned date that the invention was patented."

This specification is printed in a book entitled "Specification of Patents," and as printed in 1866 found in the Astor Library, in the city of New York; and it is urged that this would show a sufficient description in a printed publication. If this would be a sufficient printed publication it would not be printed until the specification had been left for some time at least, and this invention was so soon after that that this publication would not appear to be, and probably was not, made until after the invention.

Motion to have a decree opened and leave granted to put further defenses to the patent denied where it appeared that the new evidence would not affect the result.

An invention is not patented in England, within the meaning of the third divison of section 4,920 Revised Statutes, until the completed specification has been filed.

An English provisional specification is not a bar to the grant of a patent in this country, and when relied on as a printed publication under section 4,920 Revised Statutes, it seems that the defendant must show that it was actually published before the date of the patentee's invention.

Motion for opening a decree on account of an alleged change of issue made by the filing of a disclaimer by the patentee, denied where it appeared that the effect of the disclaimer was merely to limit the claim of the patent and the issue, and where the parties had full opportunity to try, and diligently availed themselves of the opportunity to try, the question which would be open if the case should be again opened.

Motion denied.

Fast Ocean Steamers.

The movement of Mr. Jacob Lorillard, of New York, to inaugurate a line of very fast ocean steamers, to ply on the European route, appears to have stirred up some talk toward attempting something similar in England. The London *Engineer* says there is a rumor afloat that a couple of vessels, each about 500 feet long, 50 feet beam, and 32 feet deep, are to be built next year. They are each to be propelled by twin screw engines of the collective power of 17,000 horses indicated, and they are to attain a regular ocean speed of 21 knots, or a little more than 24 miles an hour. The distance from Liverpool to New York is 3,016 knots, and at 21 knots the voyage would be made in 144 hours, or six days.

We see no reason to doubt that rumor is in this respect accurate enough as regards figures; whether the ships will or will not be built is quite another question. The *Engineer* does not quite see how they could be made to pay. A ship of the kind would burn 12·5 tons of coal per hour, or, in 144 hours, 1,800 tons. Allowing for contingencies she must stow at least 2,300 tons. The space occupied by the boilers and engines would of necessity be very great. The result would be that there would be practically no cargo space left, and it is found by experience that it is not easy to make a ship which crosses the Atlantic in less than seven days pay unless she carries at least 2,500 tons of valuable cargo. Such ships as those to which we have referred could not carry more than 1,000 tons at the utmost, and they would have to rely on high passenger rates for their profits. But it is very doubtful if, even in the present day, when the desire for great speed transport is intense, passengers would be found willing to pay excessively high rates for the sake of being landed in Liverpool or New York five or six hours sooner than they would be if they voyaged by a slower steamer.

As far back as thirty years ago a little paddle steamer, the Banshee, made the voyage between Holyhead and Kingstown, sixty-four miles, in three and a half hours, and this not once or twice but frequently. More recently the London and Northwestern Railway Company put on two steamers, the Rose and the Shamrock, which have done very well; but a third vessel, the Violet, which made her first trip about two years ago, may claim to be the fastest steamer carrying passengers afloat, having attained a speed of very nearly 21 knots, and making the run from Dublin to Holyhead, a distance of about sixty-nine miles, in a little over three hours. There is no reason to doubt that with a little more boiler-power the Violet could make the run to Dublin in three hours. If we turn to the Channel passage we find that, although it is claimed that the run between Dover and Calais can be made in 80 minutes, this result is only attained now and then; yet there is no reason why, by the use of suitable steamers, it should not be made in less than 60 minutes, even in rough weather, and in about 50 minutes on fine days.

A torpedo boat, of about 600 indicated horse-power, can be made to run for three hours at 20 knots, or 23 statute miles, per hour. The displacement of such a boat is about 50 tons, so that for each ton we have 12-horse power indicated. A boat large enough for the intended purpose need not have a displacement of more than 300 tons, and being made of good form, a speed of 23 miles an hour might probably be secured with 6 indicated horse-power per ton. As there would be plenty of room by comparison with a torpedo boat in such a vessel as we speak of, it would be possible to use boilers of much better proportions than can be got into a torpedo boat. Four locomotive boilers, for example, might be employed which would readily generate all the steam needed, the consumption of coal not exceeding about four tons per hour. The weight of each boiler with water and fittings may be taken at 12 tons, while that of the engines need not exceed 30 tons, or in all 66 tons. Adding screw-propeller, shafting, and flooring plates, fire bars, etc., the total weight of machinery could be kept down to 80 tons, really durable engines and boilers being obtained. The bunkers need not carry more than 10 tons of coal. It will be seen that there would remain a large margin for providing passenger accommodation forward and aft, the boilers and engines being amidship. As the boat would have to be driven at full speed in all weathers, it would be necessary to fit her with a hurricane deck or turtle back from end to end; on top of this a safe and pleasant promenade might be provided for fair weather, but in rough the passengers would have to content themselves below. But there would be no difficulty in fitting up two spacious saloons with heavy plate glass windows, which windows would stand a good deal of rough usage from the sea. In very rough weather they would be covered with dead lights, and the saloon would be illuminated from the deck, and at night by the electric light. As the voyage would occupy in all less than one hour, and every conceivable expedient would be provided to make passengers comfortable, the hardship even of being compelled to remain below would not be great. Of course, it is obvious that a craft intended to go straight through the seas which she could not get over would require special arrangements for housing the lookout and the steersman. In this way an absolutely safe and extremely fast and comfortable steamer might be produced. As her voyage would be of very short duration, the fan blast might be used without risk of clinkering up the tube plates, while the greatest possible facilities would exist for keeping the engines in proper order. In a word, the conditions under which the machinery would be worked would be exactly like those existing in the case of express locomotives.

The Cattle Plague.

An alarming plague among cattle has appeared recently in Pennsylvania, Virginia, West Virginia, North Carolina, and Alabama. At the Agricultural Department the disease is supposed to be splenic fever, or Texas fever, as it is popularly known. Dr. Salmon, one of the department inspectors, pronounces the West Virginia outbreak a virulent form of this disease, and it is probable that the others are like it.

If the disease is really splenic fever then no time should be lost in the application of the Pasteur system of inoculation as a cure. Valuable papers on this subject, with illustrations, will be found in the SCIENTIFIC AMERICAN SUPPLEMENT. For example, in SUPPLEMENT 300 is given Professor Pasteur's remarkable address before the International Medical College, London, in which the nature and results of his discoveries are described. In 323 is a very able paper by J. W. L. Thudichum, M.D., of London, embracing an account of the most recent researches into the theory of living contagium, and their application to the prevention of diseases in animals. In 337 is an account, with illustrations, of the practical application of the Pasteur system in the inoculation of animals.

Seeking a Common Prime Meridian.

The Senate passed, July 28, the joint resolution introduced by Mr. Flower, authorizing the president to invite delegates from all nations to meet with American delegates in Washington, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the world.

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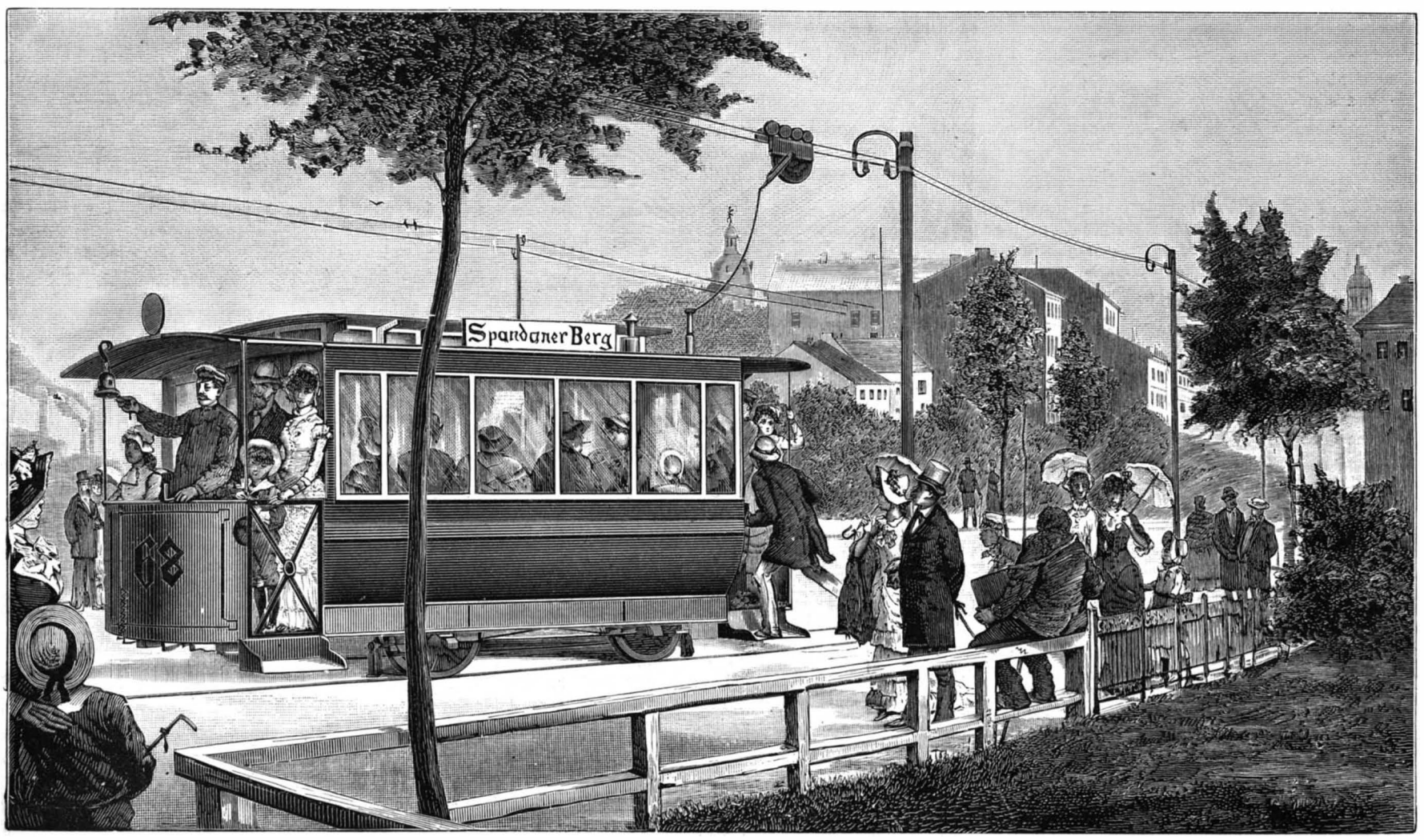
THE ELECTRIC RAILWAY AT WEST END, NEAR BERLIN.

Electricity is gradually but steadily replacing gas and petroleum for lighting purposes, and now is even beginning to replace steam as a motive power. But few electric railways have been built as yet, but a number of them are projected; among them one from the foot to the summit of the Wartburg, near Coburg. The annexed engraving represents part of an electric railway which runs from West End, near Charlottenburg, Berlin, to the well-known summer resort and beer garden known as the "Bock," near the fortress Spandau. The current is not conducted to the electric motor through the rails, as has been customary heretofore, but separate cables are used, which are supported by insulators sustained on poles about fifteen feet high. These cables run parallel with the tracks, and the motor is connected with the cables by a double conductor attached to a small carriage running on the cables. This carriage is drawn along on the cables by the car or engine, and takes the current from the cables, delivering it to the conductor connected with the motor on the car. The West End Spandauer Bock Electric Road has some quite steep grades, the hill near Spandau being especially bad; but, nevertheless, the car, which, when filled, contains twenty-four persons, is moved at about the same rate of speed of a freight train. The probability is that all electric railways constructed hereafter will be provided with separate conducting cables and a carriage thereon for conducting the electricity to the engine, as shown in the engraving. Mr. Werner Siemens is the constructor of the above-mentioned electric railway.—*Ueber Land und Meer.*



THE ELECTRIC RAILWAY AT WEST END, NEAR BERLIN.

Paris as a Seaport.

The French Society of Civil Engineers have recently had under consideration a project of M. Bouquet de la Grye, Hydrographer to the Navy, for rendering Paris accessible to ships with a draught of six or seven meters (say 23 feet). He proposes to deepen the Seine bed by dredging, and to lower the water level between Rouen and Poissy, so forming a maritime basin about 103 miles long and 150 feet in width, twice the width of the Suez Canal. The excavation would progressively reach a depth of about 53 feet below the present bottom at Poissy, and the water level would be lowered about 40 feet. The quantity of matter to be removed is estimated at the enormous figure of 75,000,000 cubic meters. Only the sharper curves of the river should be avoided; bridges should be raised or rendered movable. At Poissy vessels should rise by a "cascade" of locks, about 110 feet in the forest of Saint Germain, to an upper canal, fed with water from the Seine, by means of turbines driven by the fall of Seine water at the locks of Poissy. This canal would extend to Aubervilliers, passing above the Seine and the railways; its level would be nearly that of the canal of La Villette. There should be two harbors, a lower and an upper, at the borders of the forest of Saint Germain, and ships going to the higher canal should not interfere with those at the lower port, whence Transatlantic merchandise should be sent straight to the Rhine Valley. The expense of the lower canal, between Rouen and Poissy, is estimated at about 150,000,000 francs, that of the upper about 100,000,000. The scheme has been vigorously discussed, and some eminent engineers have taken grave objection to it. Among other points the new behavior of the waters of the Seine at low water, and in times of flood, the maintenance of the new bed, the expense of execution (thought to be underestimated), are noted as presenting difficulty. The problem of the bridges between Rouen and Poissy is not regarded as easily soluble. It is asked, How will the *régime* of rivers or streams entering the Seine between Rouen and Poissy be affected? How are their mouths to be treated so as to maintain their water level and avoid damage to property on their banks? What of the strong drainage of land along the Seine, with resultant injury to cultivation from lowering the level of the river? Will not the waterfalls at works, the foundations of houses, wells, springs, in a word, property generally, be gravely compromised?

The Channel Tunnel.

Some interesting observations on the Channel Tunnel have been communicated to the French Academy of Sciences by M. Daubrée. After referring to the three stages of the work, the scientific researches, the preparatory operations, and the execution of the project, he points out that while the Rouen chalk is water-bearing in its upper strata it is only slightly so in its lower beds. The French Association have dug two wells at Sangatte, each about 95 yards deep, and have begun to run two galleries from them toward Shakespeare's Cliff under the sea. In one of these galleries, at a depth of 60·7 yards below the French hydrographic bench-mark, the Beaumont perforator will be at work, and in the other the machine of Mr. Brunton will be employed. On the English side the under-channel gallery begins at a depth of about 32 yards below the French hydrographic bench mark, thanks to the drier nature of the chalk near the surface, and runs under the sea at a descending slope of 1 in 80. This gallery is now nearly a mile long under high-water mark, and no water has entered it as yet. The mass of the rock through which the tunnel is bored is quite dry, but from time to time little tunnels of water are met with issuing from cracks in the rock. The cylindrical form of bore adopted by Colonel Beaumont has an advantage under these circumstances, as it allows of the gallery being insulated from these tricklings by means of an iron lining formed of rings having a diameter equal to that of the gallery. These rings are in five segments, bound together by ribs, through which pass bolts which connect the segments together, and each ring to the next ones. When a water fissure is encountered, one or more of these rings are placed over it so as to mask it completely. At first four segments are put into position and then the fifth or key is added. The last joint is tightened by a band of thin sheet iron inserted into it. When the spring from the rock is tolerably strong it is luted with a cement containing red-lead before the rings are placed over it. If the fissure is oblique a sort of tube has to be built up of the rings until it is masked, but half an hour serves to place a ring into position. Owing to the slope of the gallery the borers recently attained a depth of 56 yards below the French bench-mark. At this point the depth of low water is 5½ yards, so that the thickness of strata between the tunnel and the sea bottom was there about 50 yards.

Flameless Combustion.

At the *soirée* of the Society of Chemical Industry at Owens College, on Thursday, the 6th inst., a new theory of combustion was practically illustrated by Mr. Thomas Fletcher, of Warrington, the results being so totally unexpected that many present would, and in fact did, go away with the impression that some deception was being practiced. Mr. Jacob Reese, the inventor of the Reese fusing disk, has stated his belief that, if it were possible to produce combustion without flame, the temperatures and duty obtained from any fuel would be enormously increased. It has remained for Mr. Fletcher to not only prove the possibility of flameless combustion in more than one form, but also to demonstrate practically the enormously high temperatures which can be obtained by this means. Taking a ball of iron wire, about three pounds in weight, Mr. Fletcher placed it on a slab of fire-clay, and directing a blowpipe flame on it for a few seconds he suddenly blew the flame out. The temperature increased so rapidly that in a few seconds the wrought iron fused and ran into drops, and this temperature was steadily maintained. The room was darkened, but the closest examination did not show a trace of flame, although the fact that the gas was burning was proved by repeatedly relighting and extinguishing it. The same experiment was repeated in another form by directing the flameless heat into a small fire-clay chamber, in which a refractory clay crucible, made specially for nickel melting, was partially fused and worked into a ball like soft putty, the sides of the fire-clay chamber being at the same time fused. The heat was so tremendous that the blowpipe laboratory which was given up to Mr. Fletcher for the evening was much too hot to be agreeable, in spite of open windows and ventilators. How far this discovery can be utilized remains to be seen, but it would appear that the presence of flame, usually considered to be a sign of combustion, is really an indication of imperfect results, and the best duty is to be obtained only when flame is totally absent. It is certain that such temperatures as obtained by Mr. Fletcher without flame have never previously been obtained with the fuel used, which was nothing more than a small gas supply for a quarter-inch pipe, assisted by an air-blast.

Seeing and Signaling.

M. Charpentier tells us that the time elapsing between a person seeing a signal and being able to repeat it with his forefinger is about thirteen-hundredths of a second. With some people the interval is twice as long, but the above may be taken as the average. M. Charpentier terms the interval in question the "duration of luminous perception," and he measures it in a very ingenious manner. A black disk is set revolving at a given speed, and the observer faces it, having under his finger an electric key. There is a small opening or window in one part of the disk, and when this comes round opposite the observer he sees a light shining through it. Immediately he presses the key and an electric signal passes to the revolving disk. The disk is stopped, and the distance between the window and the record of the signal being measured furnishes the result. The distance between the two points on the disk is, of course easily turned into time, since the disk was revolving at a known speed.

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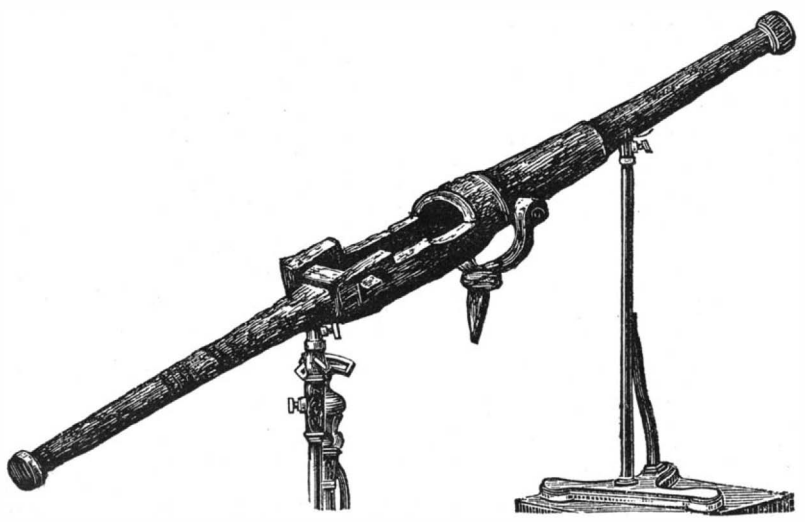
ANCIENT BREECH-LOADER.

We have been favored with a photograph, reproduced in the engraving herewith, showing an ancient piece recently fished up in the harbor of Santander, which appears to have attracted considerable attention. It is a wrought iron breech-loading piece—length of gun, 1·85 meters (6 feet); that of lever or tail piece, 0·85 meter (2 feet 9 inches); caliber, 50 mm. (nearly 2 inches). It will be seen, then, that this piece has four features that we generally associate with very modern guns: (1) It is wrought iron; (2) it is a breech-loader; (3) it is about 36 calibers long; (4) it is a pivot gun without provision for recoil. Those who are at all familiar with ancient pieces, however, know that these features were found at times. In the Rotunda Museum at Woolwich are several guns resembling the above in some features, among them an English gun of the fifteenth century, a Chinese gun taken in the last Chinese war, of unknown date, and a gun taken out of a vessel of the Spanish Armada. It is not easy to say exactly what was the office of this Santander piece. The spike pivot generally was fixed in a tripod, but no doubt might equally well have been fixed on the side of a ship. Probably the gun was a Spanish one of the fifteenth century. More than that can hardly be said, especially without seeing it. The effect of the sea water on it might tell something. Iron has been found so completely honeycombed by the action of the sea water that when shot were first taken out the finely divided mass of iron was so attacked by the oxygen of the air that the metal steamed and became hot. Indeed, this effect is said to have caused considerable alarm to the finder in one instance, who ran away from the shot on observing its strange behavior.—*The Engineer.*



AN ANCIENT BREECH-LOADER.

Icebergs and Ice Fields in the Atlantic.

Usually the Atlantic ice fields have ceased to be a peril to navigation before midsummer. This year is an exception, not less in the long continuance of the ice floes and icebergs off Newfoundland than in respect to their early beginning and abundance.

The Signal Service monthly charts, prepared from reports of incoming shipmasters, show that in April the general drift of the North Atlantic ice was southeasterly, its eastern limit on that course running from longitude 50° west to about 41° west, in latitude 45° north; thence its trend was a little westerly until the southern limit was reached in about 39° north. The coasts of Labrador, Newfoundland, and Nova Scotia were blocked with ice. The chart for May shows a contraction of the vast triangular ice field, whose limits were shown to be still more contracted in June. The ice should have substantially disappeared by July, but it had not, nor had it at the beginning of August, when numbers of large icebergs were lingering off Cape Race. The practical lesson of the charts seems to be that transatlantic navigators will avoid delays and more serious danger from ice by keeping to the south of the latitude of New York until (or after) they reach the neighborhood of lat. 40° N., long. 40° W.

Submarine Telephony.

An interesting telephonic experiment was recently made between Brussels and Dover. A submarine cable is practically a condenser, which, by its inductive action, materially interferes with the speed of signaling. The retardation, indeed, is so great as to reduce the speed to one-fifth that attained on air lines, the same instruments being used in both cases. It was feared that this condensation would prove, for a long while, a great difficulty in the case of telephonic currents, so transforming them as to render them unintelligible. The difficulty, however, has been overcome, the honor of the achievement belonging to a distinguished Belgian physicist, M. Van Ryssel-berghe. On June 9 the new telephonic apparatus, designed for the purpose of counteracting the effects of induction on air lines and condensation in submarine cables, was tried with success. M. Bordeaux, the engineer of the Submarine Telegraph Company, was stationed at Dover; M. Banneux, inspecting engineer of Belgian telegraphs, was at Ostend, and a third operator at Brussels.

Conversation was freely exchanged through the sixty miles of cable and two hundred miles of air line. The experiment is certainly very hopeful for ocean telephony.

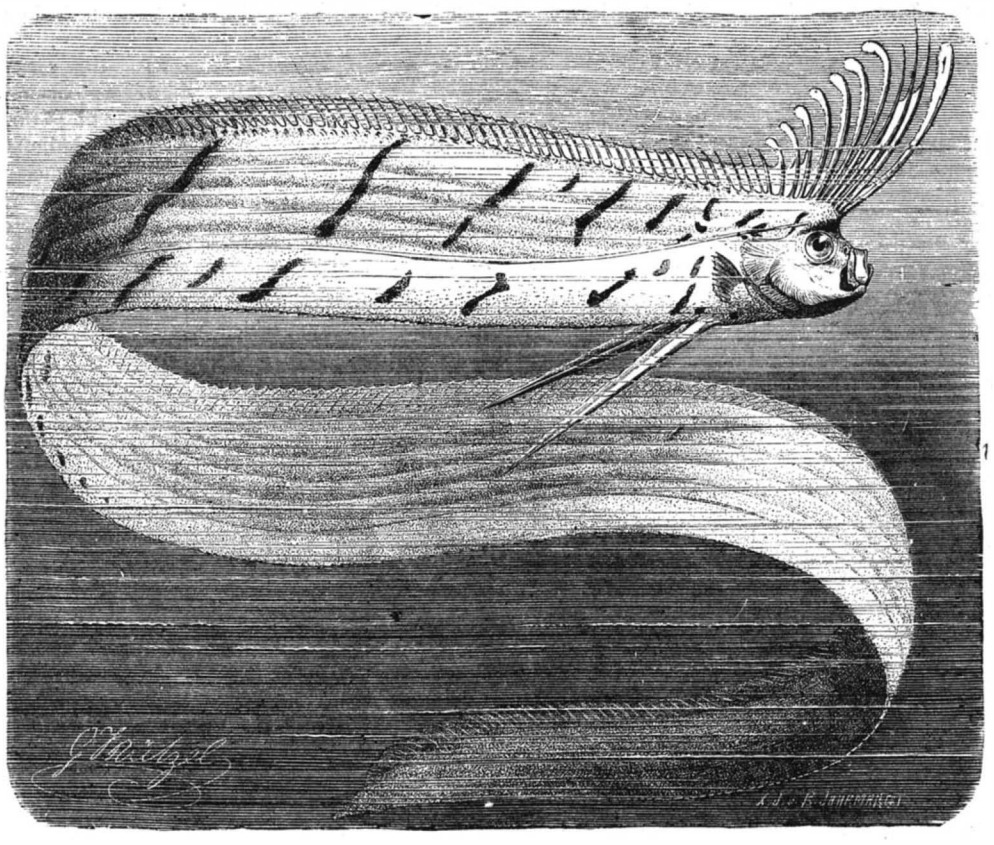
A Vigorous Mushroom.

The enormous power of cell growth was strikingly illustrated a short time since in a grain elevator at Buffalo, N. Y. The asphalt flooring was over a foot thick, in two layers. The upper layer was seven inches thick, laid hot, rolled down, and thoroughly cooled four years ago. Below was an old floor of tar and gravel, six inches thick. A curious bulge in the floor was first noticed, covering about a square foot. In six hours the floor was burst open, and a perfectly formed mushroom, with a stem two inches through and a very wide cap, made its appearance. Elsewhere the floor is smooth and unbroken.

THE HERRING KING.

The attention of scientists has frequently been called to the band fishes (*Tænioidei*), more on account of their odd form than for their value as a food fish. Their body is of an extraordinary length, and is flat like a band or ribbon, and is covered throughout with small, beautiful, bright and shining scales. The dorsal fin extends over the entire back, and the ventral fin is missing altogether, or consists of a few long thin or fragile bone spurs, which are in the front part of the body near the pectoral fins.

Among the band fishes the herring king (*Regalecus banskii*), which is found in the northern seas, always creates more or less of a sensation every time one is caught, and that is seldom and far between. As this fish lives in the greatest depths of the ocean it very rarely occurs that one is washed ashore. It was first discovered on the Norwegian coast in the neighborhood of Bergen, in 1776, and as the herring were passing along the coast at the time, the new fish was named the Herring King. Later this fish was observed on the Scandinavian and Scotch coast, and lately a specimen was caught at Stavanger, and was preserved in an almost perfect condition. The most striking feature is the exceedingly great length, as most of the specimens caught measured from 9 to 18 feet in length. The head is relatively very small, and provided with minute teeth. The bright, silvery, ribbon-shaped body is provided with dark spots and stripes, and the dorsal fin is of a mild pink color. The first spines or ossicles are of an uncommon length, and form a fan-shaped and exceedingly fragile head ornament, which was not found in a perfect condition in any of the specimens.



THE HERRING KING.—(*Regalecus Banskii.*)

A Venomous Lizard.

A great surprise has visited herpetological London, in the shape of a venomous lizard! We have so long been accustomed to ridicule as "fabulous" the belief prevalent in some countries that certain lizards have a poisonous bite, that we are slow to commit ourselves to the recognition of a living lizard, "all of whose teeth are grooved and connected with poison glands," as we are informed at the Zoological Gardens. This startling reptile, presented by Sir John Lubbock, is from Mexico; it arrived on July 16, and has since drawn crowds of the zoologically curious to inspect it, and, at first, to doubt it! As yet I have seen no printed or authentic account of the distinguished stranger; but, until more able pens shall give your readers a scientific description of it, I may briefly describe it as about one foot and a half in length, of a somewhat thickish form, and with a rather short, pointed tail. Except in color its aspect is not prepossessing. Heloderm is its name, *Heloderma horridum* scientifically. My only knowledge of the Greek language is that it is subservient to science, and zoologically defiant of gender and case, sometimes of spelling; therefore conjecturally *helo*, the first part of the generic name, may have reference to the pale yellowish or sunny color of this creature, as certain flowers, helianthemum, heliotrope, and helianthus, are named from *helios*, the sun, as our botany books instruct us; and *derm* is certainly skin. Heloderm is of a pale ocher or maize color, with a coarse reticulation of black marks all over it; and its specific *horridum*, deferentially inferring its terrible, dreadful qualities, is *not* given in slangy disgust, as is supposed to be the case with its neighbor, *Crotalus horridus*. "Horrid rattlesnake!" exclaimed a lady visitor in my hearing. "What's the use of calling *that* one 'horrid,' as if they are not all horrid!"

An interesting field of inquiry is now open to herpetologists in seeking for a "missing link" among the saurian tribe, and to discover by what singular modification one lizard has developed—not a single pair of fangs like its ophidian relatives, but—a whole row of grooved teeth, and by what process of evolution all these teeth are supplied with venom.

It would appear that this lizard is not altogether unknown, for—as the story goes—a gentleman in Mexico was once bitten by one of the species, his hand and arm in time becoming so seriously injured that amputation seemed the only hope for him, so he lost his arm but saved his life, and afterward entertained the regretful idea that he might have enjoyed the latter without the penalty of the former. The only deducible argument from this accident is that Heloderm's venom is very different from serpent venom, which rapidly, instantaneously decomposes the blood to the remotest extremity of the body, "acting on the nerve centers," as experimentalists tell us, and "destroying every vital function." However, those who unpacked the Heloderm fortunately escaped a bite, which is probably due to the fact that the reptile was languid or lethargic after its journey, for it was handled fearlessly—because unconscious of danger—by the keepers and others; but its dangerous qualities having been reported, it was tested with a frog, which died after a few savage bites, and then a guinea pig, which was convulsed and dead in three minutes after one bite on its leg.—*C. C. H., in Land and Water.*

Nickel in Oregon.

At a recent scientific meeting in San Francisco announcement was made of the discovery in Southern Oregon of a large deposit of nickel ore, resembling that discovered in New Caledonia in 1864, the development of which by the French has so greatly extended the economical use of this metal. The New Caledonia minerals are known as garnierite and noumeite, both hydrated silicates of nickel and magnesia, occurring with chrome iron, steatite, and other minerals found only in serpentine. There are, likewise, two of the Oregon minerals, one dark, the other pale apple green, like those of New Caledonia, and closely corresponding with them in hardness and specific gravity.

THE largest sailing vessel afloat was launched at Belfast, Ireland, July 6. She was built by Harland, Wolff & Co., and was named the Walter H. Wilson. Her measurement is 300 feet by 42½ feet by 25 feet. She will be classed 100 A1 at Lloyd's. She is built of iron, has four masts, three of which are square rigged, and is capable of carrying 4,000 tons dead weight

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Specific Heat and Latent Heat.

Although the specific and latent heats of nearly every form of matter have been made the subjects of the most careful investigation by physicists, we fear that few practical men fully appreciate these two factors. They are apt to look upon such tables as they do upon tables that show the distances of the heavenly bodies. They know full well that these figures are the results of tedious labor and untiring patience, but they feel that they have no practical bearing upon their own work.

The melting point of metals and alloys, the specific gravity of solids and liquids, are factors of such importance to mechanics and inventors, to buyers and sellers, to manufacturers and consumers, to founders and designers, that tables of fusibility and density find their place in all handbooks and calendars, but rarely are the two other "constants of nature" placed therein. The heat of combustion receives recognition in the case of fuels, and men begin to talk more or less intelligently of "calorific intensity." Yet fusibility depends on the latent heat of fusion as well as on the temperature at which it melts. It is already pretty well known that the fuel consumed in boiling a liquid depends on the latent heat of the vapor; but that the *quantity* of heat required to heat a bar of iron red hot is any different from that necessary to heat a bar of copper to the same temperature, has probably escaped the serious attention of many an intelligent mechanic, and to those who have observed it the reason has not been quite evident.

The definition of specific heat given in our text-books is not one calculated to enlighten the common mind, or the treatment of the subject such as to interest the average reader. Knowing as we do that our readers are possessed of more than average intelligence, we have little fear of being able to make the subject of "specific heat" as clear as that of latent heat, or of the "heat of combustion." In any case our first care must be to explain, if we can, the difference between heat and temperature. Heat was formerly spoken of as "imponderable matter," because it could not be weighed. The world moves on, and we know that heat is not matter at all, but it can be measured like any other force, only the measure required is neither the imperial gallon nor the common yard stick. It is because we had to invent a new measure, which has not yet become familiar to all, that makes the measurement of heat seem difficult, if not utterly incomprehensible. Even a child notices that one thing feels hot and another cold, that what is cold to-day may be hot to-morrow, that boiling water feels quite different from ice, that a summer day is unlike a winter day, and that substances which have been near a fire feel warmer than those which have not. At first it was sufficient to call one day hot, another very hot, and a third warm, and a fourth quite warm, and so on. But some days the sun would pour down such a flood of heat that suffering humanity felt that the term "very hot" was not equal to the occasion, so they strung on a series of adjectives, such as "excessively hot," "awfully hot," etc., not forgetting the d——d hot. As these terms did not convey the same idea to different people, some measure was sought. It was known that liquids and gases expand when heated, and it was decided to use the expansion of mercury to measure the increase or decrease of heat. The thermometer does this; it goes up as it gets hotter, and down as it gets cooler. It gives no idea of *how much* heat there is in a substance, but only tells which of two bodies is the warmer. In ice water the mercury sinks to a certain point, in boiling water it rises to a given point. In our common thermometers these points are marked 32 and 212 respectively, the space between being divided into 180 equal parts. These parts are called arbitrary, but they are no more arbitrary than a pint or pound; neither have any existence in nature, as day and year have. If we cool a thermometer in snow and salt it goes down to its zero, marked 0, but by cooling it still more it goes still lower, showing that 0 does not indicate a point where there is *no heat* at all. Alcohol thermometers have been cooled to 100° below zero, and we have no reason to think that that is the limit of possibility. A substance that has a temperature of 100° is not twice as hot as one at 50°. A thermometer measures temperature, it does not measure heat; it is relative, not absolute.

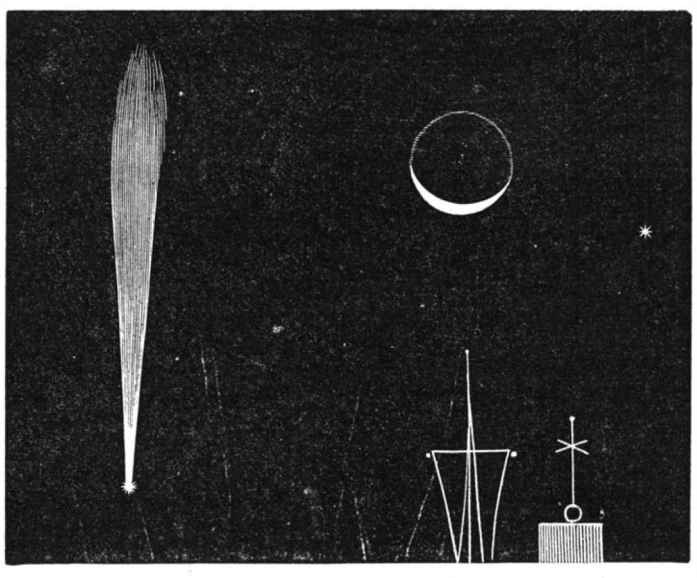
One pound of boiling water will melt a given weight of ice, two pounds will melt twice as much ice; hence there must be twice as much *heat* in two pounds of water as there was in one pound, although the temperature is the same. There is more heat in a pound of water at 100° than in a pound at 50°, but how much more we do not know. There is more heat in a pound of water at 33° than in the same quantity of water at 32°. Although we have but little idea of how much that really is, we can take it for our unit and measure others by it. We could take a pound of water at 32° and put it over a gas flame, and see how much gas it would take to heat it to 33°, and this quantity of gas would give us a unit of heat. We should find it would take ten times as much gas to raise it from 32° to 42°, as to 33°, and we could call this 10 units of heat. But gas differs, burners differ, and there is a loss of heat, so it might take more *gas* at one time than another, but it does not take more heat, so it is conducive to accuracy to speak of units of heat, in preference to feet of gas, but perhaps our explanation will be clearer if we adhere to the gas method.

A cubic foot of gas may be burned so as to heat ten pounds of water 100°. The same quantity of gas will heat ten pounds of nickel ten times as many degrees. In other words, it only takes one-tenth as much gas to heat a pound of nickel from 35° to 45° as it would to heat a pound of water from 35° to 45°. Tin and antimony require but half as much heat (or we consume but half as much gas in heating them), say from 35° to 45°, as for nickel, while lead and platinum take less than one-third.

Space forbids our entering upon the practical application of these facts. A hint will suggest others. It is well known that all metals must be heated to the same temperature before they give out light. In other words, a bar of iron when red-hot has the same temperature as a bar of red-hot nickel or silver, about 1,000° Fahr. Supposing a mechanic enters his workshop on a cold morning when the temperature is at 40°. All his tools have that temperature. Suppose he picks up a bar of nickel and attempts to heat it red-hot. It must receive a certain very definite *quantity* of heat to effect this change of temperature. A bar of silver of the same shape and weight (it would differ a little in size) would require 53 per cent as much heat, and hence consume 53 per cent as much fuel, an item of some little importance when gas is used as fuel. Iron requires about 5 per cent more fuel than nickel, while copper takes 12 per cent less. A soldering copper, weighing 2 lbs., can be heated to the melting point of tin with the consumption of about 35 per cent less fuel than a block of iron of the same weight, if all the heat is utilized. Is not this a subject that is of more than theoretical interest? Can the practical man afford to neglect to take specific heat into his calculations?

THE WELLS COMET, AS SEEN IN SYDNEY.

Concerning this visitor, Mr. Russell, the government astronomer, at Sydney, Australia, says: "The comet has lost much of the brilliancy it had when I first saw it on the 15th of June, but the tail has extended enormously. On the 19th it could be traced distinctly for 20 degrees upward, and with a slight curve to south; at its widest part it was fully 2 degrees. This evening (June 20) the comet is altogether much fainter, partly because of the moonlight, and partly because it is receding from the earth and the sun. I



THE WELLS COMET, AS SEEN AT SYDNEY AUSTRALIA.

endeavored to get a determination of the spectrum, but could only make out a faint continuous spectrum and three bright bands, probably the usual comet spectrum, which is almost exactly the same as that of coal gas. Owing to the moonlight and faintness of the comet through haze, I could not get complete measures of the spectrum. It is satisfactory, so far, that the comet is simply composed of gas; how attenuated it must be will be obvious from the fact that on June 18 the nucleus passed close to two small stars, so that the tail passed between us and them, and I could not detect any difference in the light of the star when seen through the comet's tail or without any intervening cometary matter. The comet will probably be visible with a telescope until September; but, although it is a very fine comet, it has not attained the magnificence that the early observers anticipated. Like the great comet of 1880–1843, its perihelion is made very close to the sun, and a much finer display was expected than has been made, and it must now decrease is brilliance, although the tail may get longer. The comet was discovered on March 18, by Mr. Wells, Albany, New York.

The Loss of Heat in Combustion.

In a note on the heat of combustion of hydrocarbons, published in the *Journal* of the Russian Chemical and Physical Society, Professor Mendeleeff shows that in previous determinations of the combustion heat of hydrocarbon compounds the correction due to the physical and chemical changes which accompany chemical reactions has been neglected. Thus, in burning fuel to carbonic acid, and passing this through incandescent carbon, there is obtained the reaction $CO_2 + C = CO + CO$, which shows that out of two volumes of carbonic acid we get four volumes of carbonic oxide; but this action is attended by an absorption of heat. The same result is obtained when water is passed through heated carbon, and $CO + H_2$ is produced. Therefore the professor says that in using calorimetric data of chemical reactions—*i.e.*, the records of the actual quantity of heat set free in the process of combustion, as measured by any form of calorimeter, these data should be cleared of the influence of the physical and mechanical processes which accompany the reaction. This is equivalent to stating that a certain proportion of the calorific intensity of combustion is not available for measurement in a calorimeter, or otherwise for actual duty, because it is absorbed in internal work. The correction is similar to that made when bodies are weighed in air, in the course of careful determinations of specific gravity. Another correction which should be made is that due to the change of volume, which, as in the case of $CO_2 + C = 2\ CO$, is a consideration quite apart from the production of the change of composition. The effect of these corrections, so far as they can be made in the present imperfect knowledge of the heat of combustion, has been to reduce and otherwise modify the data applicable to twenty different hydrocarbons.

The Grape Worm.

What a host of enemies beset the grape vine! Root, stem, bud, leaf, tendril, blossom, fruit, and even the seeds, are each subject to the attacks of one or several insects. These, as a general thing, attack the vine before the fruit is ripe, and if, after all, the fruit matures, the wasps and the birds are ready to claim their share. Notwithstanding all this, we manage to have grapes, and in plenty, so bountiful is the vine, and so abundantly does it repay a little care in protecting it from its enemies. It is within a comparatively few years that the Western vineyardists found they had an insect which served their grapes much in the same manner that the codling moth does the apples; the caterpillar or "worm," living within the green fruit, and destroying it. It has on this account been called the "grape codling," but is more generally known as the grape berry moth. Thinking it to be a new species, Professor Packard named it *Penthina vitivorana;* but later observations show that it is most probably identical with a European insect, in which case *Lobesia botrana* will be the accepted scientific name.

When the grapes are examined early in July, a small spot will be found where the worm entered. If a grape thus marked is opened, there will be found within a small white caterpillar, with a cinnamon-colored head, which feeds upon the pulp of the berry, and usually eats out the contents of the seeds. If one grape is not enough, it fastens the remains of that to a sound one, by means of silken threads, and makes its way into the second berry. The result is that the berries thus attacked shrivel and die.

The worm is very active, and when the fruit is disturbed it will wriggle out of it, and let itself down by its silken thread. At maturity it is olive-green or dark brown, with a honey-yellow head, and it then leaves the ruined grape to seek a place on the leaves of the vine, where it forms its cocoon. Having selected a spot it spins a covering of silk over it, and then cuts out an oval flap, which is attached on one side, as if hinged; this flap is rolled over, its free edge fastened to the leaf, thus forming a shelter, within which it in two days turns to a chrysalis. The cocoon is sometimes made by cutting two pieces and joining them together in the middle.

In about ten days the moth appears; it is of a slaty-brown color, with pale buff markings. There are two, if not three broods, the pupæ of the last brood passing the winter in the cocoons.

The insect has been especially destructive in Ohio, where one year it destroyed, so says the *American Agriculturist*, about half the grapes in the vineyards on the lake-shore; it is also abundant in Illinois and Missouri, attacking in preference the grapes with the most tender skins. As the last broods pass their winter in their cocoons on the leaves, it is evident that raking up and burning the fallen leaves will do much to diminish this pest. The habit of the worm of leaving the berry when alarmed, and suspending itself by a thread, may be turned to good account in capturing this insect where the number is not large.

Comparative Weight and Yield of Eggs.

A correspondent of the *Country Gentleman* gives the standard yield and weight of eggs for the different varieties of domestic fowl as follows:

Light Brahmas and partridge Cochins, eggs 7 to the pound; they lay, according to treatment and keeping, from 80 to 100 per annum, oftentimes more if kept well. Dark Brahmas, 8 to the pound, and about 70 per annum. Black, white, and buff Cochins, 8 to the pound; 100 is a large yield per annum. Plymouth Rocks, 8 to the pound, lay 100 per annum. Houdans, 8 to the pound, lay 150 per annum; non-sitters. La Fleche, 7 to the pound, lay 130 per annum; non-sitters. Black Spanish, 7 to the pound, lay 150 per annum. Dominiques, 9 to the pound, lay 130 per annum. Games, 9 to the pound, lay 130 per annum. Crevecœurs, 7 to the pound, lay 150 per annum. Leghorns, 9 to the pound, lay from 150 to 200 per annum. Hamburgs, 9 to the pound, lay 170 per annum. Polish, 9 to the pound, lay 150 per annum. Bantams, 16 to the pound, lay 60 per annum. Turkeys, eggs 5 to the pound, lay from 30 to 60 per annum. Ducks, eggs vary greatly with different species, but from 5 to 6 to the pound, and from 14 to 28 per annum, according to age and keeping. Geese, 4 to the pound, lay 20 per annum. Guineas, 11 to the pound, lay 60 per annum.

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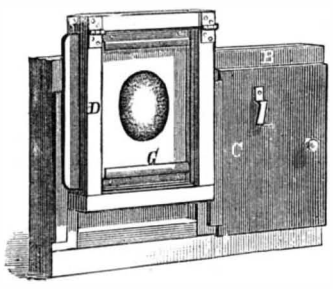
RECENT INVENTIONS.

Handle Attachment for Tilting Chairs.

Mr. Charles F. Valiant, of State Centre, Ia., has recently patented a handle to attach to tilting chairs for use in raising or lowering them, as shown in the annexed engraving. The hand grasp, B, has at its ends journals that bear in sockets formed in plates, C, that are secured to the back of the chair by screws. A horn that projects from the upper end of the grasp serves as a stop for the hand of the user, and a ring at the lower end of the grasp serves as a towel holder. The handle may be attached to the back of the chair in any position to suit the convenience of the user, and by it the chair may be easily raised or lowered to its different positions by one hand only, leaving the other hand free for use for any other purpose.

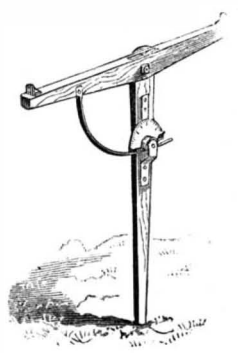
Vignetting Attachments for Photographic Frames.

An attachment for photographic printing frames, by which the printing of "vignettes" is facilitated, has been patented by Mr. William L. Champlin, of Whitestown, N. Y., and is shown in the accompanying engraving. Two grooved tracks, B, are attached to the printing frame, and in these tracks a slide moves, one half of which is open, and over this open part a sliding box frame, D, is held by guide strips in such a manner that the box frame may move transversely over the slide. The inner surfaces of the frame, D, are grooved to receive the edges of the frame which carries the frame, G, of the vignetting card. By these devices the card-holding frame can be adjusted a greater or less distance from the negative, and the sliding frame, D, may be shifted to any desired position.



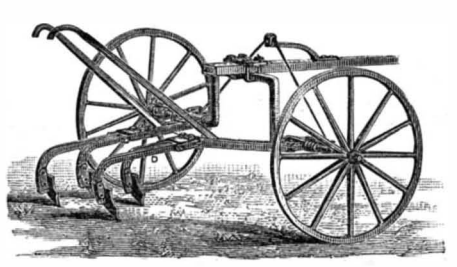
Leveling Instrument.

Mr. Frank Partee, of Defiance, O., has recently patented an accurate and simple device for determining grades. A bar is centrally pivoted on the upper end of a pointed stake, as shown in the annexed engraving, and a spirit level is fastened in the middle of the upper edge of the bar, and at its ends sight vanes are attached. A small roller is journaled in a bracket arm secured to the stake, and a pointer attached to the inner end of the roller passes over a graduated dial plate secured on the stake. A quadrant arm secured to the lower edge of the bar passes under and rests against the roller. In use the stake is driven into the ground, and the bar is leveled and then tilted to be parallel with the grade. In tilting the bar the quadrant arm rotates the roller, and moves the pointer over the face of the dial and indicates the grade per rod.



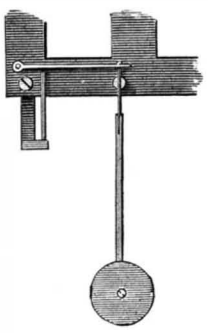
An Improved Cultivator.

An improvement in cultivators, by which a plowman is enabled to so adjust his cultivator that the shovels, when brought close together, will not be turned away from the plants, is shown in the annexed engraving. The wheels, the arched axle, tongue, plowbeams, and the shovels are of the ordinary construction. Couplings, which are made in the form of wide hooks and with flanges at the upper side of the openings, are placed upon the axle at the outer sides of its arch. Upon these couplings are flanges, to which are secured a crossbar, I, which crosses the lower part of the arch of the axle at its rear side, and to the crossbar are secured couplings attached to the forward ends of the plowbeams. The couplings are so secured to the crossbar that they may be adjusted to any desired width. With this improvement the shovels can be brought close together for cultivating small plants, and will be in proper position for throwing the soil around the plants. This useful invention has been patented by Mr. John W. Bunch, of Commercial Point, Pickaway county, O.



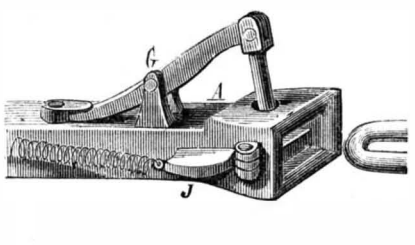
Compensating Pendulum.

Mr. James Asher, of Fort Erie, of the Province of Ontario, Canada, has recently patented a compensating device for the expansion and contraction of clock pendulums and their supporting parts, and thereby preventing irregularities in the clock movement from the expansion of the pendulum. On the front plate of a clock frame, made of brass or other metal, a pendulum is suspended by its spring from one end of a lever, pivoted at its other end to the front plate, as shown in the engraving. The spring passes through the usual split stud on the plate, the stud being the center on which the pendulum swings. A support projecting downward from the frame sustains a rod, the upper end of which touches the pendulum supporting lever at a point near its pivot. The lever is of the same metal as the frame, and the rod is of zinc, or other metal whose coefficient of expansion is greater than the metal used in its support. When the temperature falls below the normal, the pendulum rod and the plate contract, and with the ordinary construction would shorten the pendulum, but in this case the zinc rod also contracts and allows the lever to drop, and the movement being multiplied on the outer end of the lever, the shortening by contraction is thus compensated, and it will be seen that a reverse effect will take place when the pendulum and plate expand.



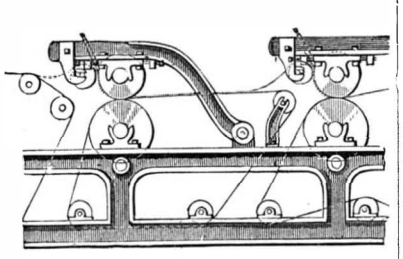
Car Coupling.

The engraving shows an improved car coupling lately patented by Mr. Thomas C. Ryan, of Fort Collins, Laramie county, Col. The bumper heads, A, are made with flaring mouths to guide the coupling link to its place. The coupling pin which passes down through a hole in the bumper head is hinged at its upper end the to lever pivoted to the upper end of a stud, G, attached to a bumper head. The lever can be readily operated to raise and lower the pin, and levers and rods may be connected with it and extended to the tops or sides of the cars if desired. On one side of each bumper head is an aperture, within which is placed a triangular plate, J, that is pivoted at its angle to the bumper head at the forward end of the aperture, so that its inner angle can be turned into the bumper head to support the coupling pin when it is raised and the link is withdrawn. To the outer angle of the plate is attached a spring, the tension of which tends to turn the inner angle of the plate to the center of the bumper head, when the pin is raised and the link withdrawn; but when the cars are run together the end of the coupling link strikes against the edge of the plate and pushes it back from beneath the pin and allows it to drop through the link, coupling the cars.



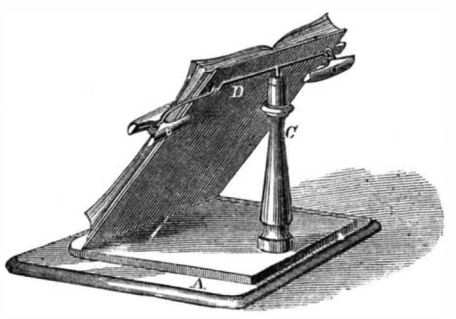
Paper Machine.

The accompanying engraving shows an improvement in paper machines recently patented by Mr. William O. Jacobi, of Butler, N. J. It is designed to dispense with the use of roll covers in straw wrapping and board mills, and to avoid the necessity of using so much skilled labor to attend the machines. The web of the paper coming from the vat upon the felt, passes beneath the press rolls of the first press, and the paper adhering to the upper roll is carried between it and a small auxiliary roll, until it comes in contact with the edge of a doctor plate which separates the paper web from the press roll, when it passes over a cushion roll to the felt of the second press. The operation is repeated at the second press, and the paper passes to the drier felt. The web of paper being taken from the upper roll by the doctor plate, is prevented from adhering to the press rolls, and the labor and attention heretofore required to insure the passage of the web is saved. The upper rollers are journaled in a swinging frame, and to remove them it is only necessary to raise the frame, and in returning them they come accurately to their place. This construction also facilitates the renewal of the endless belts upon which the web is carried.



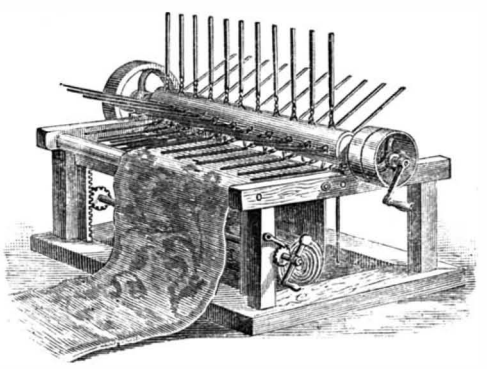
Book-Holder.

A new device for supporting and holding books for copying has recently been patented by Mr. William W. Brown, of West Union, O. Upon a suitable base plate, A, is placed another plate that is fitted so as to swing on the plate, A, around a post, C, fitted on the base plate, and supporting a horizontal bar, D, pivoted in a socket in the top of the post, as shown in the engraving. The book to be copied from rests at its bottom near the front edge of the swinging plate, and bears across the pivoted bar, D, near its top. Clips are provided for holding the book to the bar, D, and a knob secured to the front edge of the swinging plate, at the foot of the book, prevents it from slipping from the bar when not held by the clips. When the swinging plate is turned with the book upon it the bar, D, will also turn with the book. This holder will prove a great convenience for copyists and others who are obliged to handle large books.



Carpet Beating Machine.

An improvement in machines for beating carpets has recently been patented by Messrs. Titus S. Church, of Boston, and John E. Dow, of Cambridge, Mass. In bearings on a suitable frame a revolving cylinder is journaled, having longitudinal rows of eyes placed on its outer surface. Beaters made of strips of flexible material are provided with snap hooks at one end, by which they are attached to the eyes on the cylinder. An adjustable vibrating table upon which the carpet to be whipped is placed, is composed of a series of rods placed in a rectangular frame, this frame being pivoted to the main frame. The outer edge of the table is supported upon a board that is adapted to be moved rapidly up and down by a rack and pinion. The rapid vertical vibration of the carpet, with the beating, causes the dirt to be rapidly and thoroughly removed from the carpet.



Valuable Natural History Collections.

Arrangements have been completed for furnishing the American Museum of Natural History in Central Park with a complete collection of the mammals and birds of North America, and of the quadrumana of the world. The mammals and birds will be the gift of Mr. Morris K. Jesup, and the specimens of the monkey kingdom that of Mr. Robert Colgate, both well known as public-spirited residents of this city. Prof. Henry A. Ward, of Rochester, has taken the contract to secure the specimens and ship them, mounted in the best manner, to the museum.

The Jesup collection will include seven or eight hundred specimens, to cost in all $10,000. The Colgate collection will include about three hundred monkeys, apes, baboons, and lemurs, to cost $7,000. Prof. Ward thinks that the collections can be completed in three years.

Poisonous Red in Stockings.

An English chemist, who had been called upon to analyze several socks and stockings of a red color, which had been found to cause great irritation to the skin of the wearers, discovered the cause of the trouble in the tin salt used as a mordant in fixing the dye. He succeeded in obtaining over twenty-two grains of tin in the form of the dioxide. When acted upon by acid perspiration the tin oxide forms an exceedingly irritating compound.

The Superiority of Earthworks.

The judgment of American engineers with respect to the superiority of earthworks over masonry for defense, as demonstrated during our late war, has been confirmed by the bombardment of Alexandria. A council composed of Admiral Seymour and the leading English military authorities at Alexandria, after a careful investigation of the effects of the bombardment, decided that masonry is useless against modern guns, while earthworks turn every shot.

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ENGINEERING INVENTIONS.

Mr. Arthur E. Beattie, of Brooklyn, N. Y., has patented devices by which car brakes are worked by the motion of the train. Journaled in frames below the car are two friction wheels, that can be adjusted up and down from the rail by means of a shaft, lifting chain, and lever. The shafts of the friction wheels are connected by suitable chains and pulleys to the brake chains, whereby, when the wheels are in contact with the rails, the chains connected with the brake chains will be wound on the axles of the friction wheels and the brakes pressed against the car wheels. When the frames are raised the brakes are loosened.

Mr. F. A. Richard Von Bernewitz, of Sedamsville, O., has patented an improvement in car couplings. The coupling bar has at each end a triangular head. Across the end of the car is a recess in which two blocks slide that are pressed together by spiral springs. The adjoining ends of the blocks are beveled toward each other, so that the triangular head of the coupling bar will fit against their beveled edges. Levers attached to each block are crossed and pivoted to each other and to a standard on the car frame, and when the levers are pressed down the blocks are separated, and when up, released; the springs behind the blocks press them together. The coupling bar is suitably supported, and when the cars are run together the wedge shaped head presses the coupling jaws apart, until the head passes back of the jaws, when the springs close them, coupling the cars.

Mr. William Coppin, of London, Eng., has recently patented improvements in paddle wheels for vessels. The vessel is of the usual construction, having at its mid length openings through its bottom for paddle wheels. The paddle boxes are air tight, and fit as snug as may be to the wheels, and the shafts of the wheels pass through airtight boxes. Air is forced into the paddle boxes and sufficient pressure maintained to force the water down, so that there is just sufficient to immerse the lower paddles. Channels are formed in the bottom of the vessel that extend its entire length, and are in depth about equal to the width of the paddles on the wheels. With this construction the wheels act in the most efficient manner for the propulsion of the vessels, and are protected from the action of the wind and waves.

Improvements in cable traction for street cars have recently been patented by Mr. Orlando H. Jadwin, of Brooklyn, N. Y. The clutch of the car consists of a foot rigidly attached to a slotted shank, forming one of the main jaws, and a rocking shoe, loosely pivoted to a shank, that slides in the slot of the other shank, and forms the other main jaw of the clutch. Upon the ends of the rocking shoe are supplemental rocking shoes, which always bear flat against the cable irrespective of the position of the main shoe. The cable is relieved of the weight of the clutch by means of springs or a balancing weight. The clutch is connected to the draw bar by a metal frame, so constructed that it will oscillate transversely to allow the clutch to be adapted to the varying angles of the cable.

Mr. Abraham O. Frick, of Waynesborough, Pa., has recently patented improvements in the construction of traction engines by which the following desirable results are secured: first, perfect freedom to vibrate vertically without destructive strains on the teeth of the gears; secondly, an elastic rotary strain from the engine, so that if the wheels are stopped by an obstruction the teeth of the gears will not be broken; thirdly, means are provided to accommodate the gears to the lateral swaying motion of the engine; and fourthly, an effective means is provided for imparting an elastic strain from the engine to the traction wheels, for moving either forward or backward.

MECHANICAL INVENTIONS.

Some improvements in rotary brushes have recently been patented by Mr. Charles O. Allen, of Grand Rapids, Mich. The central wooden core has bristle sockets bored in it from opposite sides, the holes nearly meeting, leaving a small hole formed by the screw of the bit to connect the two opposite sockets, to form a continuous hole. Tufts of bristles are then caught by looping two wires around their middle parts, and the bristles are drawn into the sockets from the opposite sides, the wires passing through the small hole in the middle. The free ends of the wires are then laced through the next sockets, and a second set of bristles are drawn in. This construction saves stock and holds the bristles very strongly.

An invention that relates to the manufacture of barbed metallic corrugated strips for fencing has recently been patented by Mr. Samuel H. Gregg, of Crawsfordsville, Ind. A rod of iron or steel of oval form, in cross section, is passed through a pair of rolls provided with oval grooves having angular notches in their sides, lying opposite each other, the metal being forced into the recesses and forming spurs on the rod. The rod is then passed between rolls having flat square grooves, and is reduced to the desired width and thickness, and is then rolled through fluted rolls by which it is corrugated, to strengthen it and allow for expansion and contraction.

An improved automatic brake for wagons has been patented by Messrs. Charles J. LeRoy, of Palestine, and John W. Henson, of Dallas, Tex. On the reach and hounds of the wagon is supported a rocking brake arm, that is connected near its ends to the rear bolster by rods, and is connected by a rod at its center with the short end of a lever pivoted to the under side of the reach. To the long end of the lever a spiral spring is attached, which draws it rearward, while it is also connected by means of a chain with the doubletrees of the wagon. The doubletrees are supported loosely, and slide backward and forward, in a guide placed upon the tongue. When power is applied the doubletrees draw the chain, moving the lever and the brake arm, to hold the brake shoes out of contact, but when the power is released the spiral spring brings the shoes into contact.

Mr. Jacob A. Wagner, of Quincy, Ill., has patented improvements in presses designed to be operated by animal power for pressing and baling hay, etc. The invention consists in a novel and ingenious application of power to the plunger of the press, by means of compound levers with adjustable attachments to change the leverage, so that a very powerful action may be obtained toward the completion of the pressure. The main lever of the machine is made to operate all the parts. After the material has been sufficiently pressed to form a bale, it is secured by ties or wires in the usual manner.

Improvements in rock drilling machines have recently been patented by Mr. Joseph L. McClughen, of Ozark, Mo. The feet of the machine are provided with rollers that can be swung under them to move the machine. The drill carrying frame is pivoted to an upright standard on the base frame, and can be turned to set the drill at any desired angle, and is held in position by a spring catch and segmental rack bar. The drill is raised and lowered by means of a crank and worm gear. In operation when the crank shaft is rotated, a tappet raises the drill frame, which, after the tappet passes, is forced down by a spring, thus giving a rapid reciprocating motion to the drill, which is also turned as it reciprocates. A coil spring raises the drill off the rock when it strikes, and prevents the drill bit from catching in the sides of the cavity made by it.

An improved three-wheeled vehicle adapted to be propelled by hand for road service, has been patented by Mr. John L. Lowrey, of LaGrange, Ind. The frame of the vehicle is curved at the front end and square at the opposite end, and is mounted on an axle journaled in boxes on the under side of the frame. The axle has traction wheels, one of which is fast and the other loose. The front of the frame is mounted on a caster wheel, that is turned to steer the vehicle by a vibrating bar moved by the feet of the operator. For applying driving power, a handled cog wheel, connected by proper intermediate gear wheels with the axle, is mounted on a support near the seat of the rider.

A device that facilitates the dumping of wagons has recently been patented by Messrs. Henry S. Bernhart and Isaac R. Ritter, of Reading, Pa. The wagon box has a false bottom that is inclined from the front toward the rear, and its rear end has an opening and a spout, the opening having a suitable gate for closing it. The box rests on a frame, and the wagon is constructed with two adjustable circular racks at the rear end of the frame, and a circular rack with an extensible arm at the front of this frame, and with suitable gear wheels, sprocket wheels, and a driving chain for operating these racks, whereby the box may be raised and inclined by the front and rear racks; or the rear racks may be disengaged, so that the front end of the box will be raised only.

An improved combined cider mill and press has recently been patented by Mr. William W. Bard, of Elizabethtown, Ky. At the ends of the frame of the machine rollers are journaled, over which an endless apron made of hair cloth passes. From these rollers the apron passes between a series of vertical compressing rollers, so arranged that each succeeding pair is nearer to each other, and are all revolved with equal speed. In front of the vertical rollers is a guide, that turns up the edges of the apron so that it will pass between them in a fold, and apples fed upon the apron are held by its upturned edges and carried between the rollers. The liquid pressed from the pomace falls upon a tray and passes to a proper receptacle.

Mr. John H. Newell, of Scottville, Ill., has patented a device for regulating the motion of windmills for supplying water. A float is placed in the water tank, that when the water rises to a high level in the tank, operates to trip a weight that pulls the wind wheel around into the plane of the tail vane and stop the pump. This weight is held until the fall of the water to the low level trips a heavier weight than the first, and lifts the first weight to release the windwheel, and allow it to work. At the same time the first weight is set to be held, so that the wheel will continue to run, until the float rises again and it is tripped, thus automatically regulating the supply.

AGRICULTURAL INVENTIONS.

Mr. Enos M. Miles, of Lawrence, Kan., has recently patented an improved corn planter. The planter is mounted on wheels that serve the purpose of sustaining the weight of the machine, imparting rotation to the axle, and thereby rotating, reciprocating the seed slide, and rolling down the furrow in which the seed is dropped. By means of a valve of peculiar construction the dropping of seed is automatically done, and may also be dropped by means of hand levers at the will of the operator. Mechanisms are also provided for dropping the seed at any required point, so as to check row.

Mr. Dallas Carr, of Chandlerville, Ill., has patented a device designed to be applied to a sulky plow for equalizing the draught when using four horses abreast. Combinations of levers of different lengths, and proper adjusting devices, are connected with pivoted crossbar of the draught devices, on opposite sides of the plow beam, for equalizing the draught by giving to the pair of horses nearest the plow beam the shortest working leverage, and to the pair the further from the beam the longest leverage. Provision is also made for adjusting the plow to work at different depths and to cut furrows of different widths.

A combined revolving spader and roller has recently been patented by Mr. Enos M. Mills, of Lawrence, Kan. The spader consists of a series of cutters that are successively forced out of a revolving cylinder through slots on its periphery by means of suitable devices in the interior of the cylinder. The spaders are drawn back again into the cylinder by the retraction of coiled springs. In combination with the spader, and on the same axle, is an auxiliary roller that serves to roll the ground after it is spaded.

A machine for cutting the weeds from between cotton rows and for chopping out the cotton plants for thinning them, has been patented by Mr. John M. Walden, of Fort Valley, Ga. The frame of the machine consists of four longitudinal bars, secured to each other at a little distance apart. In the spaces between the outer and inner bars are placed the wheels that carry the machine, and between the inner bars is placed the wheel that operates the chopper to thin out the plants. A little in advance of the wheels, and suspended from the frame, are the hoes that cut the weeds. Next after the hoes follows the chopper, and after the chopper hoes to throw up the earth against the plants. The construction and arrangement of the chopper is such that the forward thrust of it is very quick, after which it rests, and is drawn forward to cut the plants as far as desired, and is quickly returned.

MISCELLANEOUS INVENTIONS.

An improvement in burglar alarms has been patented by Mr. Peter Moran, of Philadelphia, Pa. The clock mechanism and gong are of the usual construction, and are placed in a box and secured at a proper point upon the wall. Setting wires or cords lead from the window or door with which it is desired to connect the alarm, over friction rollers to the box into which they pass, and are attached to rods that have at their opposite ends springs that hold the wire taut and allow the rods to be drawn. Any movement of the rod is communicated to the alarm by means of studs on the rods that operate a pivoted lever.

Mr. John W. Albright, of Yarmouth, Ia., has patented a new fastening for horse collars. The collar is made open at the bottom and closed at the top. The fastening consists of two parts, one of which is made with sockets and end slots, the other having catch bolts to engage with the end slots, whereby the collar is fastened and unfastened. The collar can be narrowed or widened by screwing the bolts out or in. To one part of the collar is secured a leather flap that overlaps the joint between the ends of the collar, to prevent the pole strap from being drawn into the joint. The flap has a keeper to receive the pole strap, and prevent its dropping when the collar is unfastened.

Mr. William Teeple, of Watertown, D. T., has patented improvements in stoves whereby hay and straw may be effectively burned for heating and cooking purposes. The base of the burner is made square, and deep enough to provide space for a large ash pan, and in a circular opening in its upper surface is pivoted a grate. Over and outside of the grate is placed a sheet iron cylinder, and on its top is an inner flat cover, and an ornamental outer cover. Inside of this cylinder is a smaller cylinder formed of parallel bars connected at their ends by rings. A cylinder in which straw is packed is adapted to open when it is passed into the grated cylinder, and leave the straw when it is drawn out. The space between the grated and sheet iron cylinders gives draught for burning the straw.

Mr. Charles Palmer, of Springfield, Tenn., has patented an improved case for showing and facilitating the weighing of shot or granulated material. A circular show case is divided into wedge shaped compartments by radial partitions, and is mounted on a vertical shaft journaled in a base. A revolving plate fits on top of the case, having an opening of the size of one of the compartments, through which the shot is poured. Each compartment has in its bottom an opening through which the shot is discharged into a receptacle or the scoop of a scale. These openings are closed by gates pivoted to the under side of the case, and held closed by a spring.

A device for regulating the flow of sap from the reservoir to the evaporating pan has been patented by Mr. Charles F. Mansur, of Weston, Va. The sap flows from the reservoir through a pipe in a box containing a valve, and from this box into the evaporating pan. As the liquid rises in the pan, a portion of it passes into an auxiliary vessel containing a float. The float is connected by a rod to the valve of the supply pipe, and as the float moves upward the valve is carried upward also until it is pressed on the end of the supply pipe, closing it and stopping the flow of sap. As the liquid in the pan is floated away the float descends, permitting the sap to flow from the pipe again.

Mr. Lachlan E. McKinnon, of St. Catharine's, Ontario, Can., has patented improvements in dash boards for vehicles. The dash foot is made detachable, and has a square hole near its upper end through which the bolt holding the dash to the foot passes. Near each end the lower rail of the dash is slotted lengthwise, and the heads of the dash bolts are made of such shape that they may be passed through the slots from the inner side of the dash, and when turned a quarter revolution, they have a firm hold on the outer side of the rail. The neck of the bolt is made square to fit the hole in the dash foot, and prevent it from turning in the slot in the rail. With this construction the feet and dash are adjustable to different widths of carriage bodies.

Some improvements in revolving book stands have been recently patented by David T. Koser, of Riegelsville, Pa. Upon a tubular standard secured in a base, circular shelves are supported by flanged collars that are attached to the standard by set screws. A rod enters the upper end of the standard, and is adjustably secured by set screws, to the upper end of which is fixed a plate to cover the books on the shelves. In slots near the outer edges of the shelves filling segments are secured, that are constructed of sheet metal, in wedge form, and rounded on their outer edges and finished to imitate books. These are placed between books or series of books to fill out the spaces of the outer circle.

An improved book has been patented by Francis Endicott, of Clifton, N. Y., for carrying fishing flies and snelled hooks. It prevents the flies from becoming tangled, and allows of their convenient insertion and removal. The book is of the usual construction, except that at the top or bottom of each leaf metal clips are attached, and at the opposite end of the leaf are retainers that consist of spiral springs sewed at one end to the leaf and formed at the other end with a hook for attaching the snell. A strong thread passes through each spring and through the leaf, that holds the springs in place when the flies are detached, and at the same time allows the spring to stretch.

Mr. Thomas Clapham, of Roslyn, N. Y., has patented devices by which the centerboards of vessels are arranged and operated outside of the vessel. The upper edge of the centerboard fits squarely against the keel or bottom of the boat, and is held in this position by rods or chains that work within tubes, attached to the inner side of the bottom of the vessel, and extend above the water line. The rods are firmly held by washers and nuts above the ends of the tubes. By loosening the rods, the centerboard will be allowed to swing, so that it can be turned up at either side of the boat. By this construction the inconvenience of the center board box is avoided, and the center board can be readily detached for convenience in repairing.

A cheap pavement, that will harden on exposure to moisture and is durable and firm, has been patented by Mr. John Murphy, of Columbus, O. When road bed is graded, gravel is spread over it to the depth of about four inches, and is then rolled, and over this is spread about two inches of sand and pulverized slag. Upon this is placed a layer of stones, the small ends of which are downward. The interstices between the stones are filled with a grout composed of pulverized slag, clean sand, lime, silica, Portland cement, and ore dust. Stone screenings are spread over this two inches in depth, and the pavement is rammed, when another coat of grout is poured over it, and a light coat of sand spread over its surface. On the following day the pavement is ready for use.

Mr. Erastus B. Barker, of New York city, has patented improvements in focusing attachments for photographic cameras by which very accurate adjustments can be made. The rear frame of the camera is generally adjustable by means of a plate guided by and fitted to slide in a groove in the base piece, and is held in position by a binding nut. A bar attached at one of its ends to the rear frame of the camera body has at its opposite end a projection that passes into a longitudinal slot in the adjusting plate of the camera. Between this bar and the adjusting plate is a plate that slides between guides transversely across the adjusting plate, that is slotted obliquely to its line of motion. This plate is moved by a lever in reach of the operator, and serves to move the camera very accurately for adjustment.

Mr. Charles Altemiller, of New York city, has patented an improved shutter fastener for locking shutters when they are closed. The fastener consists in a pair of hook jaws pivoted in the sill plate of the window frame and pressed together by springs. Between their rear ends is a cam block for separating the jaws, which is attached to a handle that projects to the inner edge of the sill plate. A staple on the inner surface of one of the shutters is caught and held by the jaws when the shutter is closed, and by turning the cam block the jaws will be separated and the shutters released. Springs for turning or swinging the shutters outward are attached to the outer edge of the sill plate.

A device that may be readily attached to and removed from the underside of the seat of a wagon, for the purpose of carrying such tools as are liable to be needed by a teamster, has been patented by Mr. Chester L. Wentworth, of Mount Vision, N. Y. A metal plate of suitable size and shape is secured to the seat by thumb screws, and a bar that has its ends attached to the plate is curved between its ends in suitable form to receive such tools as are desired to be carried. The bar is provided with set screws, and the oil can and tools are held to their place by the pressure of the screws. The device is simple, strong, and durable, and the tools are always in place and accessible when needed.

Mr. Frederic G. Sackett, of Knox, Pa., has patented a means for protecting oil tanks from lightning. At a proper distance from the oil tank, the iron pipes that supply the oil for and discharge it from the tank, terminate, and are connected with the tank by pipes made of non-conducting material. From the end of the iron pipes electrical conductors pass to the ground, and are connected with the ground plate. These conductors should have sufficient capacity to discharge all the electricity that may accumulate in the iron pipes. It will be seen that this arrangement insulates the tank. The vent pipe in the top of the tank for gas is also of non-conducting material, and is of sufficient length to discharge the gas at some distance from the tank.

A combined ear trumpet and cane handle has been patented by Mr. Henry Waldstein, of New York city. The cane handle is made of metal or other suitable material, and has at its upper end a hollow bulb or head from which a hollow arm projects. A tube extends from the outer end of the arm through it, and passes into the handle of the cane, and is provided with a funnel-shaped mouth. The cane head has at its lower end a series of vertical slots, and the sound entering these slots passes into the bulb or head, and is deflected into the funnel of the tube. If the end of the hollow arm is placed in the ear, the sounds collected pass through the tube to the tympanum. This ear trumpet can be held to the ear without attracting attention, as it looks like an ordinary walking stick.

An improved mould for fire kindlers has been patented by Mr. James W. Burns, of Springfield, O. The mould is divided by partitions in such a manner that when the kindler is formed it will be in the shape of a Maltese cross. The chambers of the moulds are about twice the depth of the thickness of the kindler. The follow blocks are about half the depth of the chambers, and are secured to a strip of leather or other flexible material, in such a manner as to register with the chambers of the mould. The connections of the followers being flexible also allows them to be adapted to the thickness of the kindling material.

An improved fastening for sample envelopes, by which the envelope can be opened or closed, and secured, rapidly and conveniently, has been patented by Mr. Charles W. Ballard, of New York city. The end flap of the envelope is re enforced and has an aperture near its outer edge. A metal strip that has an open hook at its upper end, a closed hook at its lower end, and a projecting metal tongue opposite the lower end of the open hook, is secure on the back of the envelope. To close the envelope the flap is pressed down until the aperture near its edge is passed over the open hook. The projecting metal tongue prevents its opening accidentally.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

See adv. of Mineral Glass, last week's SCI. AMER.

For Sale.—Castings and parts, with instructions for building the best Electric Engine, 1-30th to 1 horse power. Send for circular. L. G. Woolley, Mendon, Michigan.

Gray spent seven years in perfecting his "Elegy," but the time required to get a box of Esterbrook's Steel Pens is just long enough to send to the nearest stationer.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

Automatic Planer, Knife Grinders, best Solid Emery Wheels, Machines to run Emery Belts, etc. All warranted satisfactory. Amer. Twist Drill Co., Meredith, N. H.

See Bentel, Margedant & Co.'s adv., page 125.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 126.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 125.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 126.

Vertical Engines, varied capacity. See adv., p. 125.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

Catechism of the Locomotive. 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N.Y.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

The Sweetland Chuck. See illus. adv., p. 126.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 125.

Lightning Screw Plates, Labor-saving Tools. p. 126.

Engines, 10 to 50 horse-power, complete, with governor, $250 to $550. Satisfaction guaranteed. Six hundred in use. For circular address Heald & Morris (Drawer 98), Baldwinsville, N. Y.

Mr. T. D. Lockling, care U. S. Consul, Panama, U. S. Colombia, will sell the whole or a portion of his patent for umbrellas, illustrated on p. 82, this volume.

Air Pumps for High Pressure, Hand, or Steam Power, at low prices. C. Beseler, 218 Center Street, New York.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 108.

See New American File Co.'s Advertisement, p. 110.

Steam Pumps. See adv. Smith, Vaile & Co., p. 109.

Books for Engineers. Catalogues free. E. & F. N. Spon, 44 Murray Street, New York.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 93.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 94.

Bostwick's Giant Riding Saw Machine, adv., page 93.

Red Jacket Adjustable Force Pump. See adv., p. 94.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 94.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 92.

4 to 40 H. P. Steam Engines. See adv. p. 94.

Cope & Maxwell M'f'g Co.'s Pump adv., page 77.

Small articles in sheet or cast brass made on contract. Send models for estimates to H. C. Goodrich, 66 to 72 Ogden Place, Chicago, Ill.

Improved Skinner Portable Engines. Erie, Pa.

Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

List 28, describing 3,600 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C. Forsaith & Co., Manchester, N.H., and N.Y. city.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Vocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

NEW BOOKS AND PUBLICATIONS.

A HISTORY OF THE ST. LOUIS BRIDGE: CONTAINING A FULL ACCOUNT OF EVERY STEP IN ITS CONSTRUCTION AND ERECTION, AND INCLUDING THE THEORY OF THE RIBBED ARCH AND THE TESTS OF MATERIALS. By C. M. Woodward. St. Louis: G. I. Jones & Co. From D. Van Nostrand, New York.

A noble history of one of the boldest undertakings of modern engineering, at the same time a critical treatise upon a wide range of difficult practical problems in construction and the production and testing of materials—problems first encountered and successfully solved in the prosecution of the great enterprise which the book commemorates. It is fortunate for the profession that the work has fallen to the hands of a historian so painstaking, temperate, and capable. Particularly valuable are the chapters on the basin and regimen of the Mississippi River, the manufacture of special materials, the sinking of the east abutment and the great piers, the physiological effects of compressed air, the strength and elasticity of materials, the theory of the ribbed arch, the stability of foundations, etc. The work is generously illustrated with views of the work as it went on, plans, details, and appliances.

THE DRUGGIST'S ANNUAL FOR 1882. Compiled by H. G. Adams. New York: Root & Tinker.

The compiler has brought together a large amount of information of use to druggists, comprising statistics of imports, exports, production and consumption of drugs, chemicals, etc.; tables of average prices of many drugs for a series of years; chemical and pharmaceutical tables; lists of pharmaceutical associations; patents granted in the drug, chemical, oil, paint, and allied trades in 1881, etc.

EFFICIENCY OF STEAM ENGINES AND CONDITIONS OF ECONOMY. By R. H. Thurston, A.M., C.E. Philadelphia: Merrihew Print.

Two important contributions to the theory of steam engine economy, comprising the paper on the behavior of steam in the steam engine cylinder, and on curves of efficiency, read before the New York Academy of Sciences, February 13, 1882; and the paper on the several efficiencies of the steam engine, and on the conditions of maximum economy, presented to the American Society of Mechanical Engineers, in Philadelphia, last spring.

STEAM ECONOMY AS ILLUSTRATED BY THE USE OF THE STEAM ENGINE INDICATOR, PRACTICALLY CONSIDERED, BEING A REFLEX OF ACTUAL TESTS. By A. Wilkinson. Philadelphia: the Author.

Mr. Wilkinson says that his first thought was to lay before his readers "a conglomerate mass of hypothetical mathematics, entering into the field of mystery, confusing rather than edifying." Why he contemplated misusing possible readers that way he does not say. Fortunately or unfortunately he changed his mind, and decided to print certain "hashed up" fragments of his experience, which he hopes may prove of interest to the engineer and a benefit to the steam user. Sincerely we hope so too; but never having heard of any valuable work being done with so uncertain a motive, we have our doubts.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. K. H. asks: 1. Will you inform me if celluloid is soluble in or softened by oil? A. Celluloid is apt to soften somewhat after prolonged exposure to warm oils under pressure. 2. Would it answer for valves in a pump where oil is used in considerable quantities? A. You might try it. 3. From what other material besides oiled silk and bladder could I make thin valves for use in air pump? A. Goldbeater's skin and fine oiled vegetable parchment have been used.

(2) W. P. writes: There are said to be two substances, both solid, which, when brought into contact, immediately melt and combine and then at once become solid again, forming an adhesive composition. A Phosphorus and iodine are two such substances. The combination is accompanied by considerable chemical activity, so that care is necessary to avoid accident.

(3) H. S. R. asks: Would you give me a receipt for preventing rust on polished steel? A. Dissolve 1 ounce bleached shellac in 1½ pints of wine spirit. Warm the steel and give it a flowing coat of this lacquer.

(4) P. B. asks: In which way can peas act best as a fertilizer, when the vines are plowed under while green or after they become decayed? A. After they become decayed.

(5) D. B. T. asks: Is there ever nicotine in cigarette paper? A. No.

(6) A. W. H. writes: To drill a hole in glass keep the glass under water while drilling.

(7) T. H. P. asks: 1. Please inform me of the proportion of ammonia (and whether in liquid form) to be used in baking bread or pastry, referred to recently by the SCIENTIFIC AMERICAN, and also whether yeast or baking powder should also be used with the ammonia. A. The ammonia referred to is the salt carbonate of ammonia (ammonium carbonate). It may be used with yeast, but is more commonly employed in connection with or as part of ordinary soda baking powders. The proportion may be one-twentieth the weight of the dry powder. 2. Please refer to the number of the SCIENTIFIC AMERICAN which gives directions for preparing the copying pad of glycerine and gelatin, also for making the necessary ink. A. See page 325, vol. xli. The proportions for the pad are: 1 ounce of Cooper's gelatin and 6¼ fluid ounces of pure concentrated glycerine, a small quantity of soap (about half an ounce to the pound of glue) is now frequently added to the composition. The ink usually employed is a solution of aniline violet or blue (2RB to C B) in water, to which a little alcohol and glycerine is sometimes added; a good proportion is aniline violet (or blue) 1 ounce; hot water 7¼ fluid ounces.

(8) C. H. M. asks: Will you be kind enough to give me the formula of the acids necessary to make the gases with which they fill small rubber balloons commonly vended at fairs, circuses, etc.? A. The gas (hydrogen) is generated on putting a quantity of scrap zinc or iron into a glass vessel containing sulphuric acid diluted with three or four volumes of water. The zinc or iron is oxidized and dissolved in the acid liquid and the gas is liberated. With zinc the reaction is chemically expressed as follows: $Zn+H_2SO_4=ZnSO_4+2H$.

(9) J. M. asks: Is there any way of transferring pictures such as wood cuts on wood or canvas? A. Coat the wood or other prepared surface with rather gummy mastic or similar varnish, and having very slightly but uniformly dampened the print, press it smoothly and firmly, face down, upon the varnished surface. When the varnish has quite dried saturate the paper with cold water, and with the fingers (and, if necessary, a piece of fine sand paper) crumble and rub the paper away, leaving the inked lines adhering to the varnished surface.

(10) T. S. V. writes: I would like to know how to recover nitrate of silver from bromide emulsion. A. Dilute the emulsion with an equal volume of hot water, acidify with a little sulphuric acid, and put into the vessel a few clean fragments of pure zinc. When the silver has been all reduced wash it with hot water several times, dry, and heat it to low redness for a few minutes. When this silver is dissolved in warm nitric acid and the solution evaporated to dryness, nitrate of silver is obtained as a residue. This requires to be purified by crystallization from solution in water.

(11) J. DeW. C. writes: In your issue of May 20, appears an interesting article, "Copying Drawings," on perusal of which, I beg to inquire if there be not some error in the statement: "In preparing paper to make the positive print, and the bath is made just like the first one; except that lampblack is substituted for burnt umber." I do not find "burnt umber" as a constituent of the "first" bath; but of the second, and in the "second," "lampblack" is already apportioned; does it mean that an additional quantity of "lampblack" is to be added for positives? A. Read first sensitizing, or negative sensitizing bath. For positives replace the umber with an equal weight of lampblack, this in addition to the measure of the latter indicated. 2. Furthermore, there does not seem to be any sensitizing agent in the first bath, but in the "second," namely, the chromic salt. A. The first bath is simply preparative; it does not require to be sensitive. The second bath sensitizes the prepared paper.

(12) J. F. writes: I am about to have the front show windows of my store inclosed with inside windows. Can you tell any way to prevent the outside windows frosting in cold weather? A. Clean the glass occasionally with a cloth moistened with pure glycerine, wiping it so as to leave only a trace of the glycerine adhering to the surface—this on the inside.

(13) M. L. G. writes: I desire to gild a quantity of brass pins. I have a No. 2 Smee battery and six quart solution jar. The work turns black. Can you give recipe for battery and solution, and full details for doing the work quick and cheap? A. Use a larger anode, or increase the amount of cyanide in your bath. See "Electrometallurgy, in SUPPLEMENT, No. 310.

(14) C. B. C. writes: I have heard that there is an alloy containing cadmium that is fusible at very low temperature. I am using the Newton alloy: 8 bismuth, 5 lead, and 3 tin, but wish something better if I could get it. A. Try the following: Lead and cadmium, 1½ parts; bismuth, 8 parts; tin, 12 parts; melt the lead, add the cadmium, then tin, then the bismuth

(15) W. F. S asks: What I wish to know is, what is used on surveyors' and engineers' levels to give the brass a dark color? A. Clean the brass, and having dissolved in two pints of hydrochloric acid five ounces of arsenious acid and seven ounces of sulphate of iron, dip the brass in this liquid until properly colored, then wash well in running water and lacquer.

(16) H. R. writes: Desiring to make a rubber bag out of the ordinary rubber lined cloth, such as is used in waterproof cloaks, etc., please to inform me how I may best cement or bind together the edges of the cloth, so that the lines of junction may be perfectly waterproof and air tight. A. The cement used by the rubber companies is prepared by dissolving scrap rubber (pure gum caoutchouc) in naphtha by heating the latter gently (over a sand bath) and stirring in the rubber, until the latter is absorbed so as to form a thick sirupy liquid. It is better to let this stand for several days in a closely covered vessel before using it. When applied to cloth the naphtha evaporates, leaving the pure rubber behind.

(17) E. T. R. writes: I want to construct an apparatus so that I can convey changes of temperature in a moving body (an animal for instance) to a suitable recording apparatus by means of flexible cords. I have thought that some application of electricity could be made for this purpose. Can you help me? A. You might employ some modification of the thermopile—consult Ganot's Physics.

(18) G. H. N. writes: I would be very much obliged if you would tell me the proportions of potassium bichromate and sulphuric acid that give the best results for generating electricity in the battery. A. Pure potassium bichromate, 34 ounces; sulphuric acid, 27 ounces; water, 40 ounces.

(19) J. T. M. asks: How can I test for alum in baking powders? A. Digest an ounce sample of the powder for several hours with a small quantity of lukewarm water slightly acidified with pure hydrochloric acid, then filter (through pure filter paper), boil the filtrate for a few minutes, let it cool somewhat, then add pure aqua ammonia to strong alkaline reaction. If alum were present in the powder the ammonia thus added will cause a white flocculent or gelatinous precipitate of hydrated oxide of alumina.

(20) C. H. R. writes: In the SCIENTIFIC AMERICAN for July 1, on page 11, in answer to C. A., you give the distance of Polaris from the true pole as 1° 32′ 39″. The mean place is given in the nautical almanac as 1° 19′ 13·06″. The apparent place varies from month to month about 49″; but at no time is the distance as great as you give it by 13′ or more. (C. H. R. is correct.)

(21) L. O. asks for the reason why the babbitt metal in the tap cap on the cylinder of planing machine loosens: whether it is from shrinkage or being too hard, or whether the holes in the shell are improperly bored. A. It is from shrinkage; a little antimony mixed with the metal would probably prevent it.

(22) T. H. says: Will you please inform me if a lightning rod should be insulated or not? My house is stone, with tin roof; a copper wire rope lies on roof and is fastened to the wall with hooks; ground connection with a quantity of iron, coke, and the lead water pipe, but I am told it should be insulated. A. The rod should not be insulated.

(23) D. G. B. writes: A man in a row boat sitting upon what is termed a sliding seat, is about to take a fresh stroke, and in doing so he moves in the boat from bow to stern. Does this have a tendency to move the boat further on its course or will it retard its motion? A. It will have little effect either way, but would tend to ease the pull of the oars, as the body or weight of the man is not instantly started with the new velocity given by the pull.

(24) H S. W. asks: Do you know of any process by which Bessemer or common steel, such as is used in boilers, can be made any harder than it is when it comes from the rolls? A. The only way would be by case hardening as with iron.

(25) W. G. C. asks: 1. What form and depth of thread would you advise to resist great pressure on rolls, for rolling iron in a rolling mill, where the screws are to be 4½ and 5 inches diameter, and where the nuts, in which these screws are worked, have a depth or surface of 10 and 12 inches? A. We think a V-thread with the bevel all on the upper side. 2. Of what kind of metal would you make such screws, iron or steel? A. Steel. 3. For such screws as you may direct, what kind of metal would be the best to use for the nut? And if of brass composition, give me the formula. A. Phosphor bronze. 4. Please give me the formula for what you consider the best anti-friction metal for roll necks, where above screws are used, and where increased pressure is to be gained over that now in use on train rolls. I wish to obtain from your advice a journal that will have the least friction and at the same time combine the desired quality to sustain the greatest pressure. A. We think phosphor bronze will make the best boxes. 5. What oils, grease, or composition would you advise me on these journals and screws? A. It should be a heavy natural mineral oil.

(26) F. G. W. asks: Can a pump be driven by steam passing from a boiler underground a distance of two hundred and fifty yards, and at what loss in steam? A. You can drive a pump or do any kind of work proper for steam through the distance that you require or even to a thousand or more feet. But you must insulate your pipe from condensing influences in proportion to its length to preserve the pressure and to economize fuel. With suitable size pipe in proportion to the quantity of steam to be used, when thoroughly felted and boxed you may not lose more than 10 per cent in pressure, in 750 feet. You must provide a trap to receive the water of condensation near the pump; and also provide for the expansion of the pipe, which will be 8 or 9 inches in the above length, if straight. If you can make offsets in the line you can obviate the use of slip joints. In this way steam is used in hundreds of mines, and also underground in trenches and arches. Many miles of steam pipes are now being laid in the streets of New York. The insulation in some cases being mineral wool packed around the pipes within wooden logs, and in other cases charcoal dust in wooden boxes.

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(21) H. Z. asks: Will you please describe the mode of manufacturing sticky fly paper? A. See "Useful Receipts," in SUPPLEMENT, No. 159.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. F. H.—No. 1. Graphite. No. 2. Amianthus—asbestos of very fair quality. No. 3. Galena—lead sulphide—probably contains a trace of silver. No. 4. Clay containinga little copper oxide, silicate, and sulphide.

COMMUNICATIONS RECEIVED.

The Sun not a Source of Light and Heat.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 1, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adjustable table, J. M. May ... 262,076
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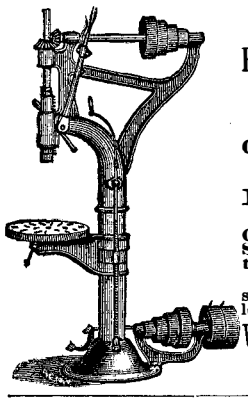

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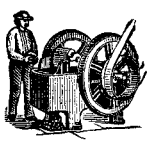

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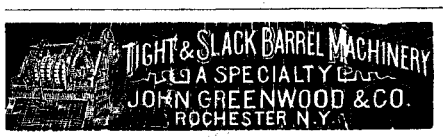

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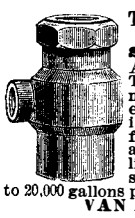

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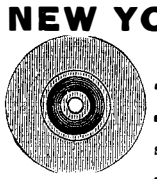
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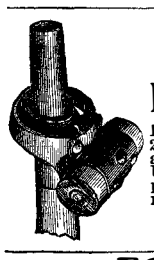

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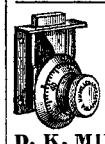

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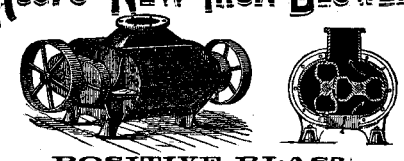

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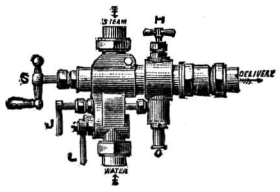

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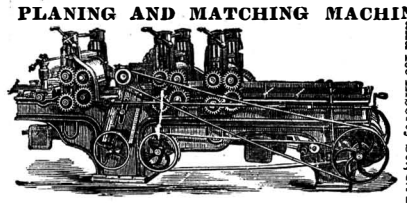

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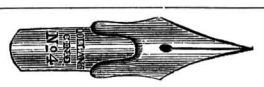

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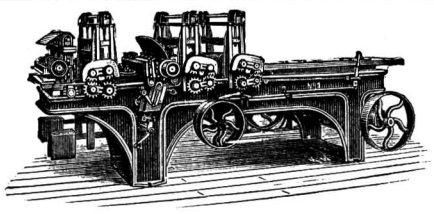

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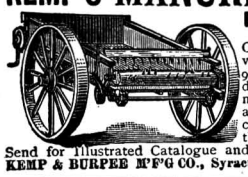

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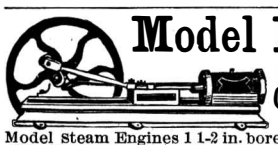

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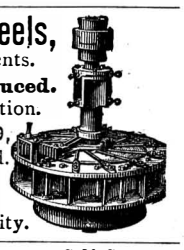

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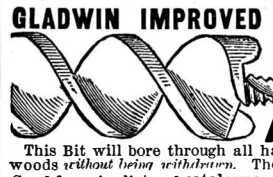

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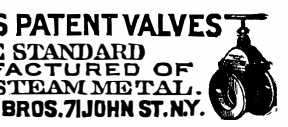

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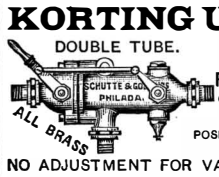

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